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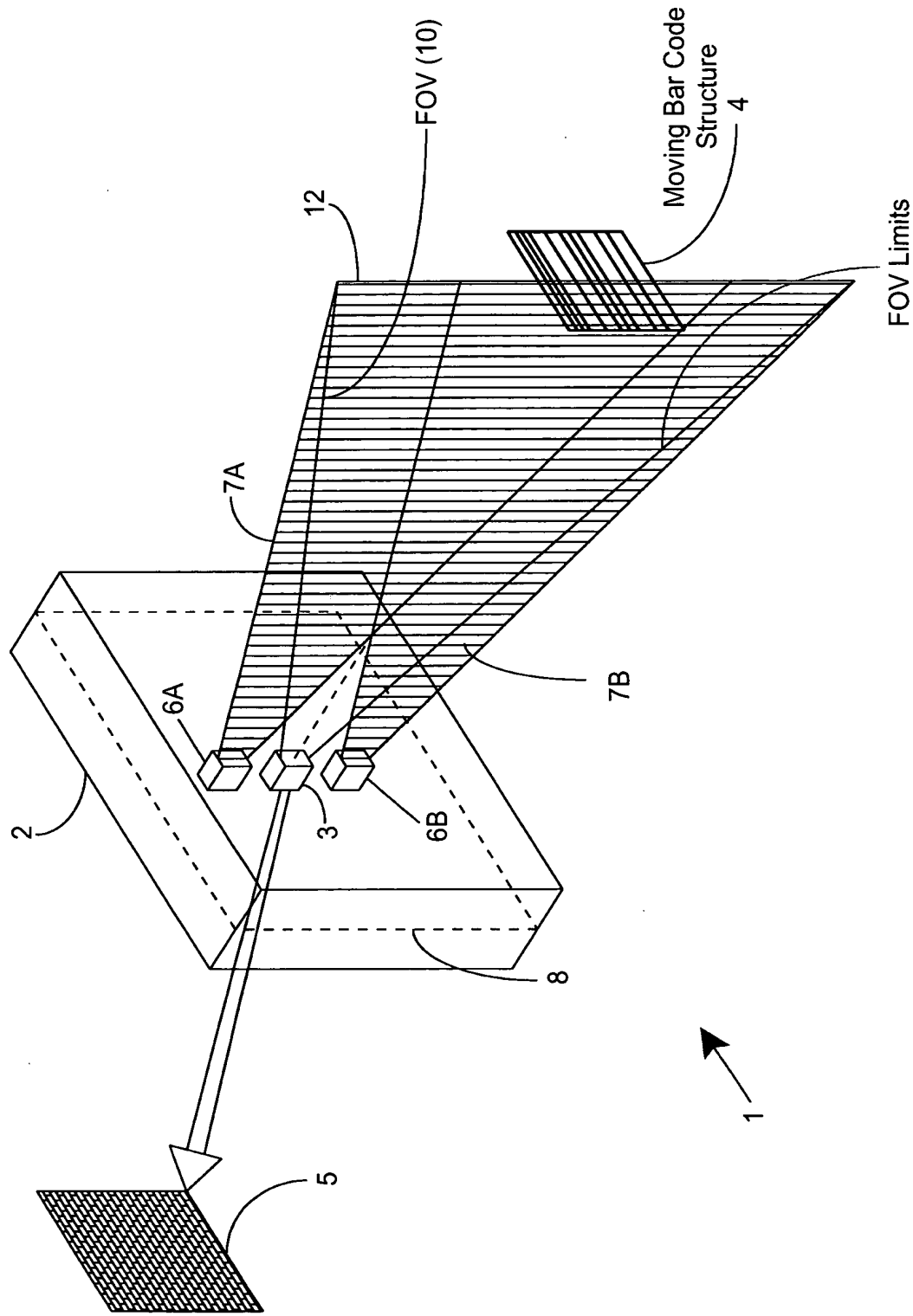


FIG. 1A

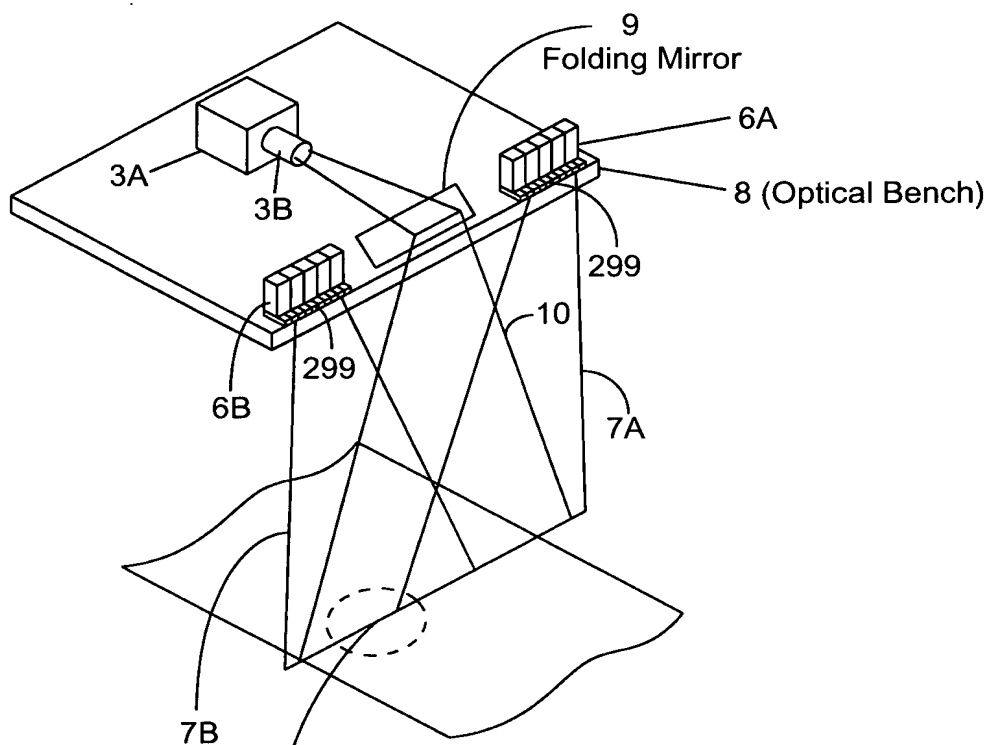
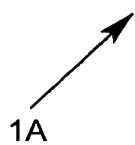


FIG. 1B1



Magnified Field of View of CCD sensor element on object

Width of projected Planar Laser Illumination Beam on object

FIG. 1B3

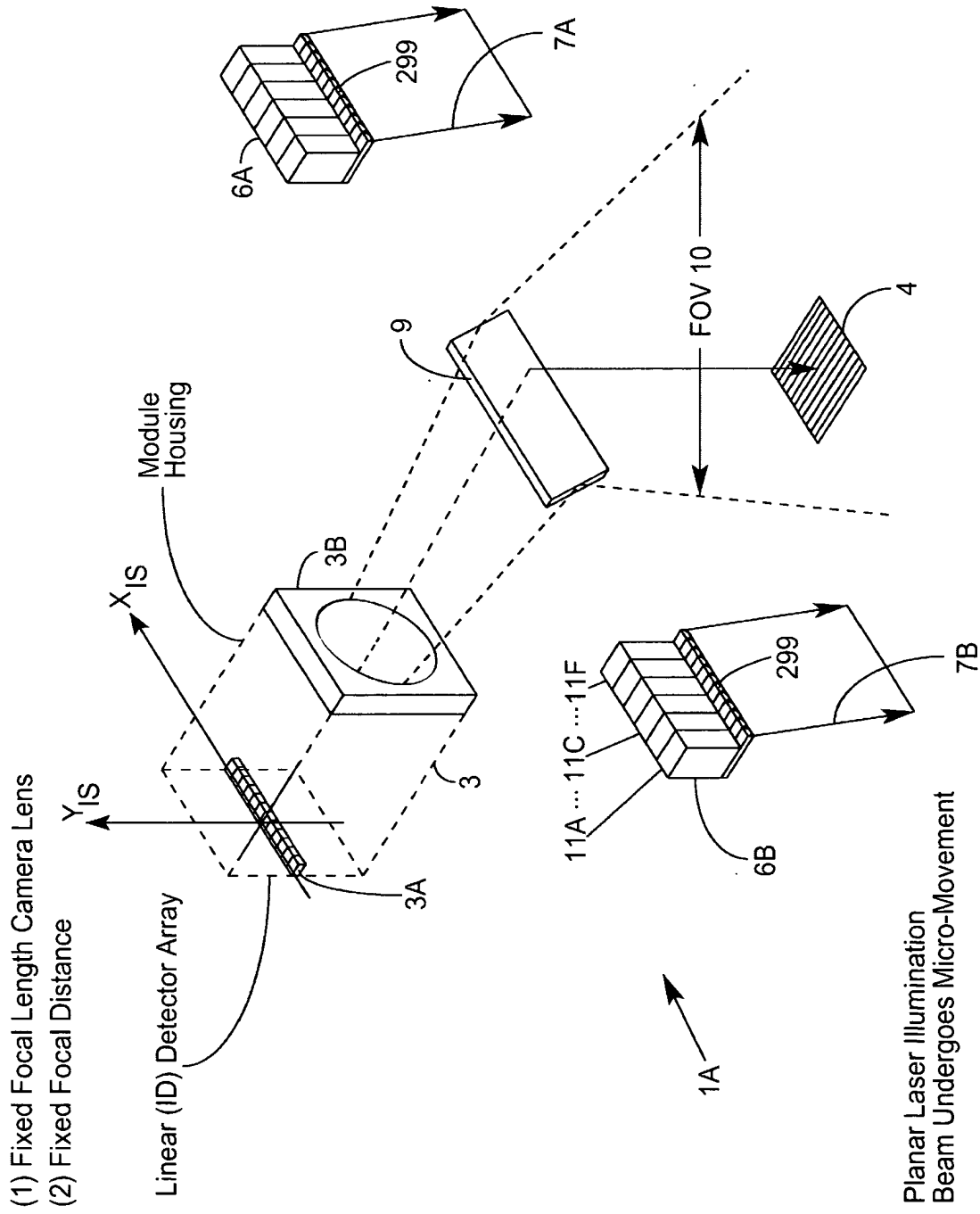


FIG. 1B2

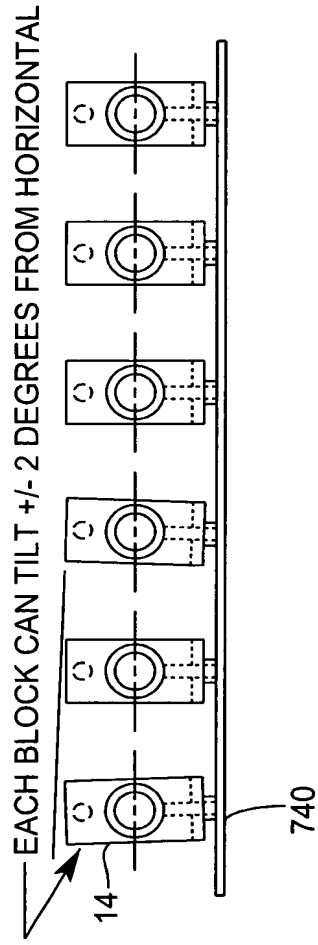


FIG. 1B4

VLD BLOCK CAN PITCH FORWARD FOR ALIGNMENT WITH OTHER VLD BEAMS

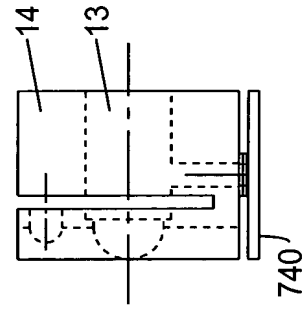


FIG. 1B5

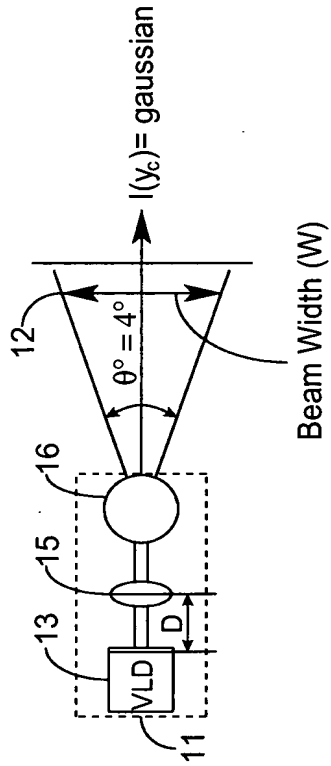
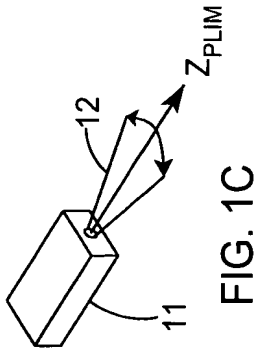


FIG. 1E1

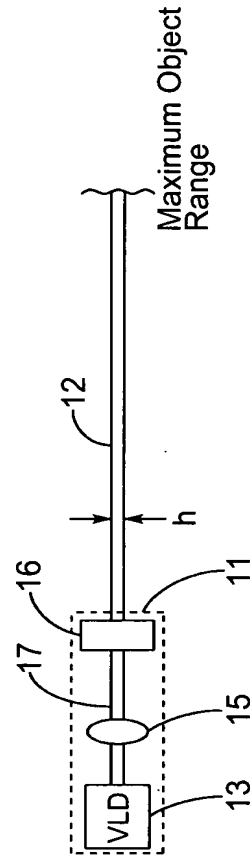
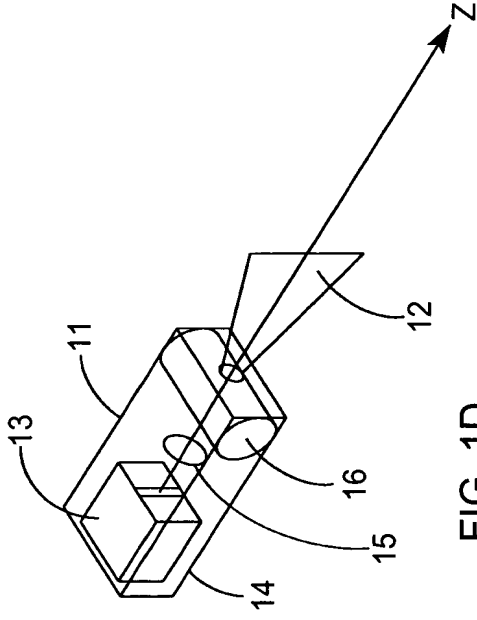


FIG. 1E2

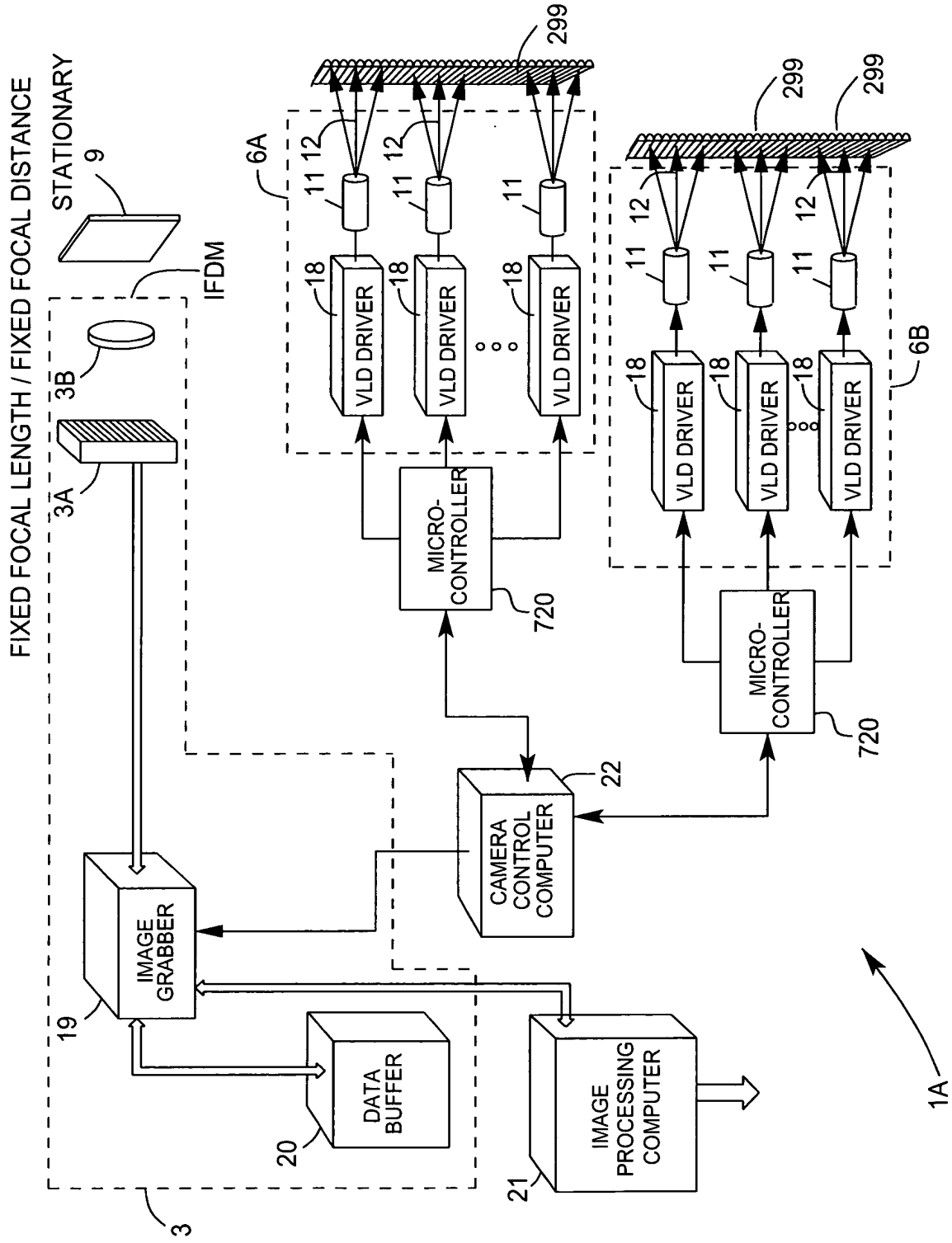
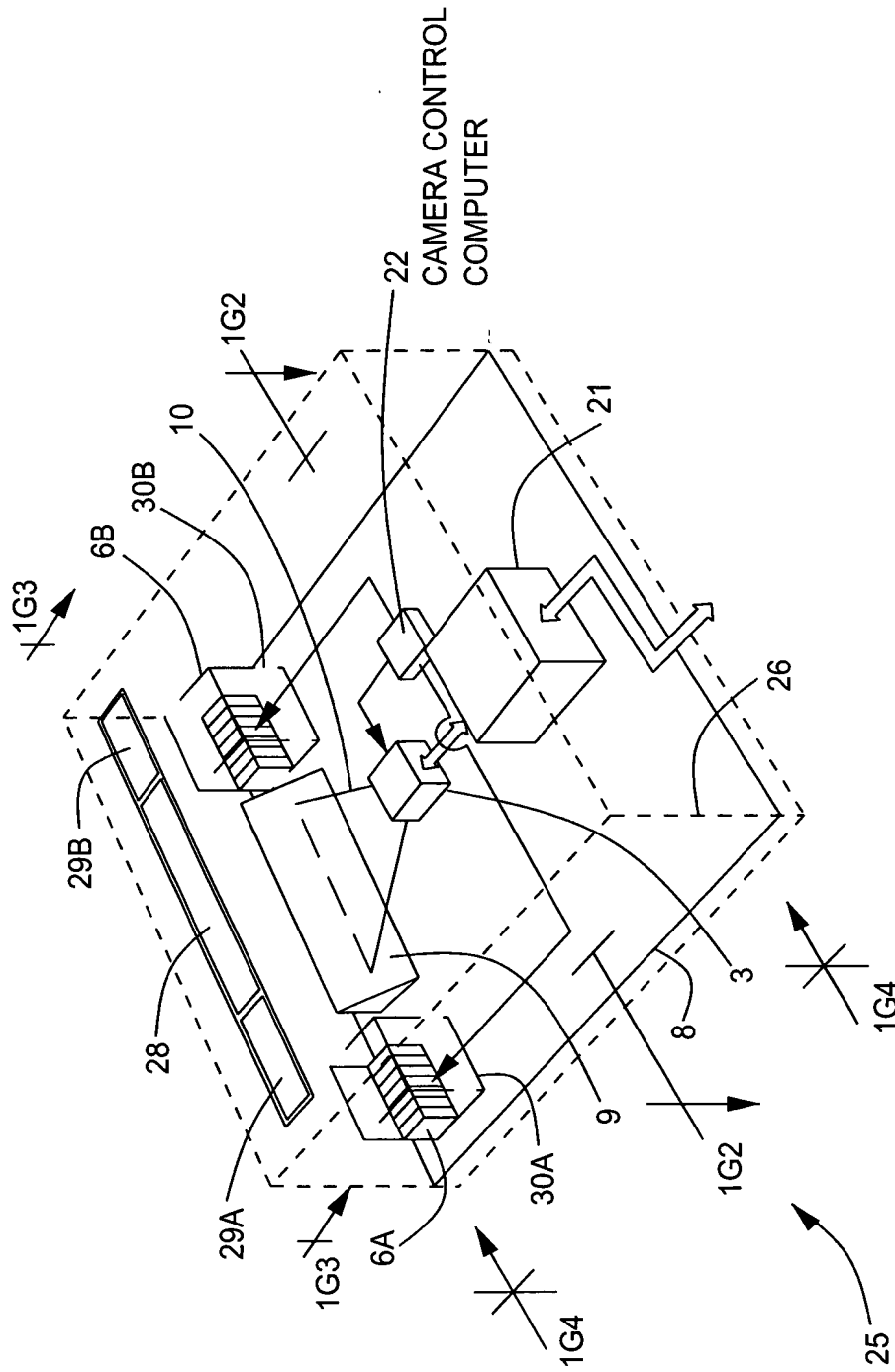


FIG. 1F



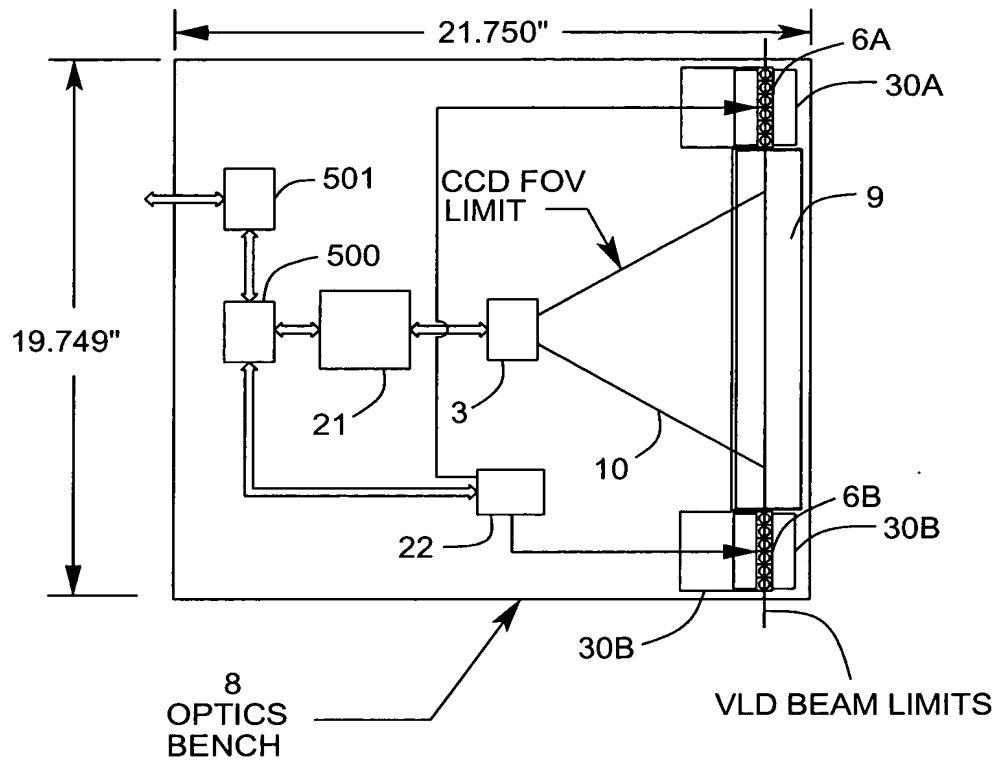


FIG. 1G2

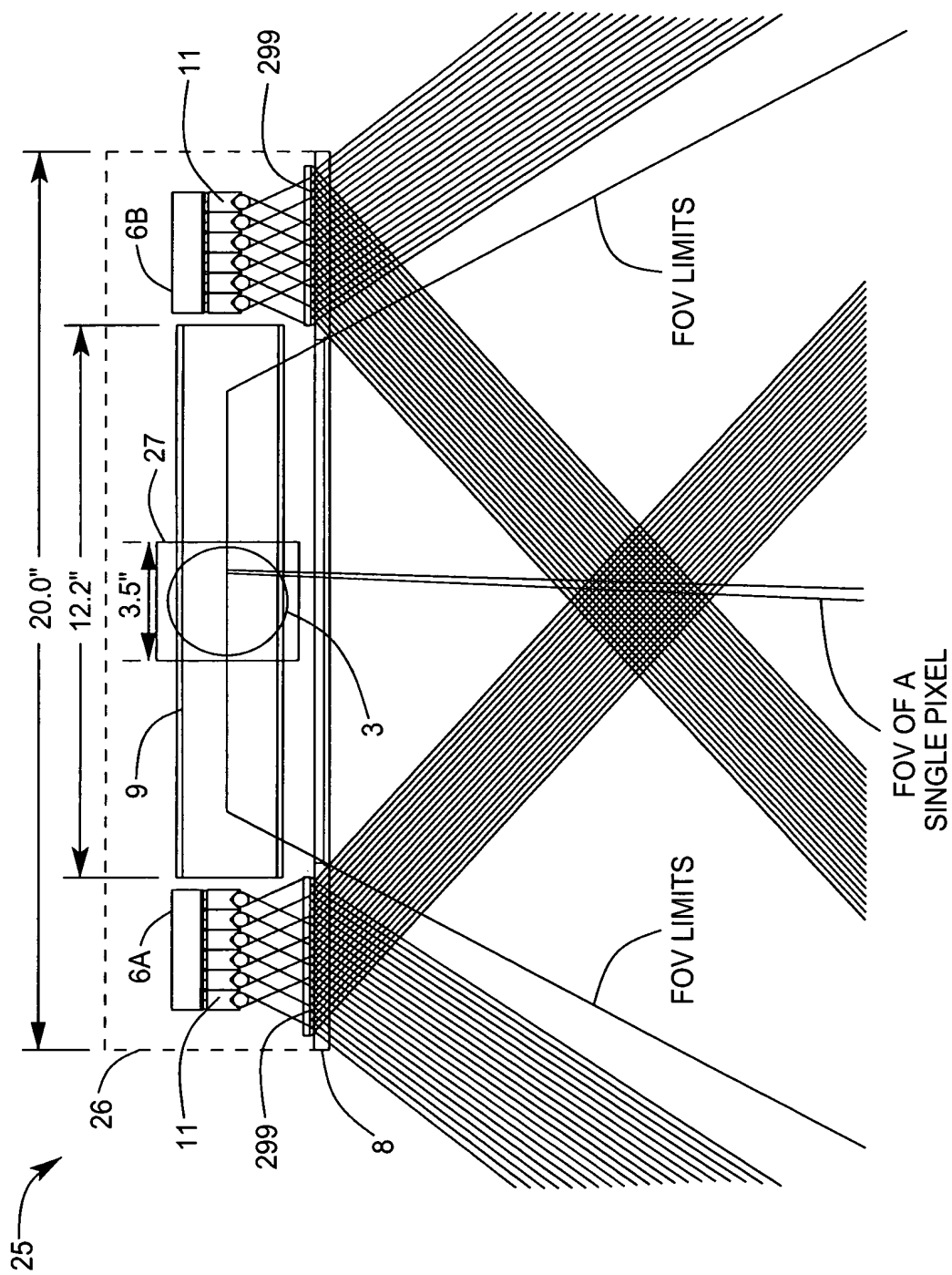


FIG. 1G3

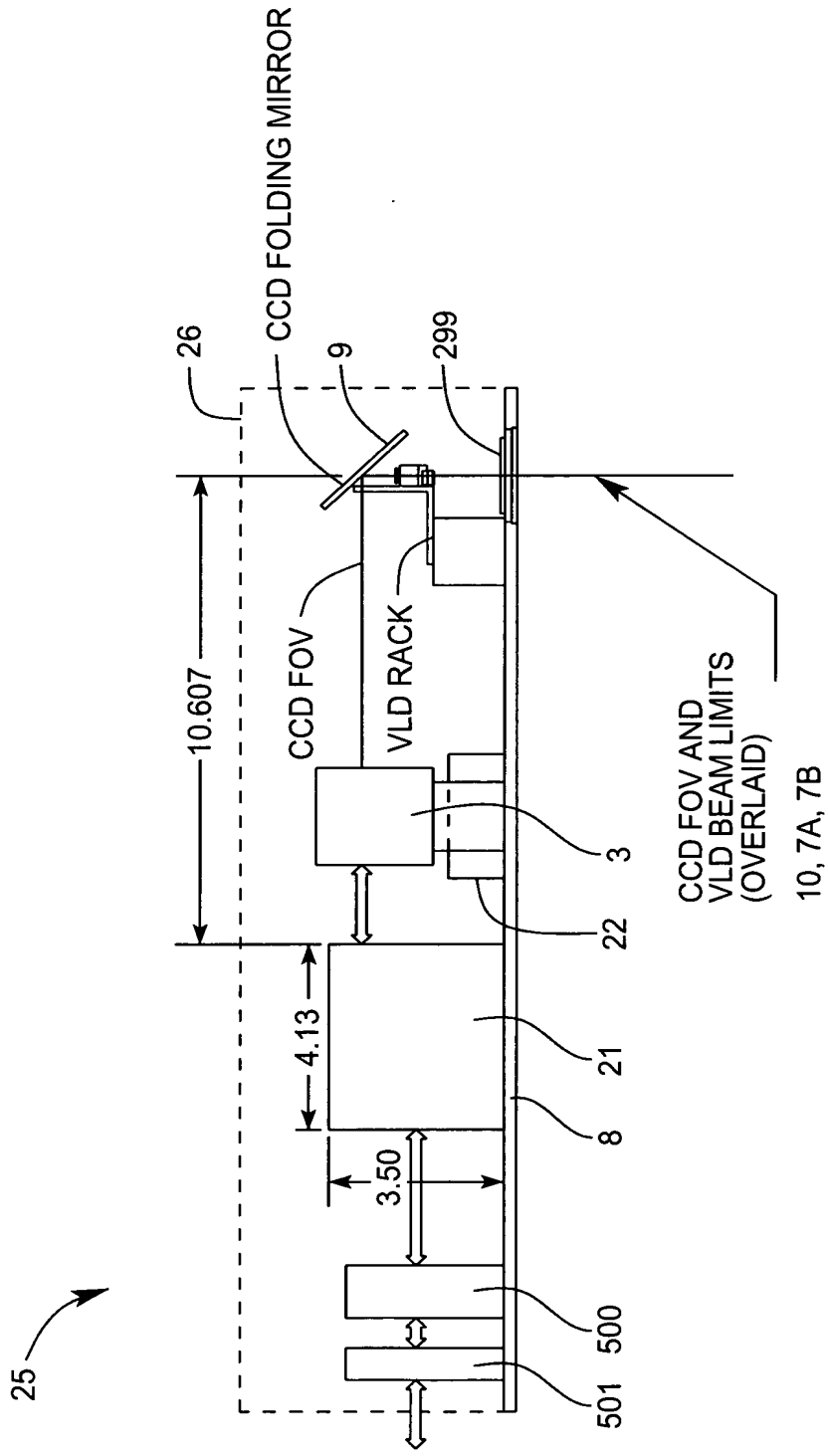


FIG. 1G4

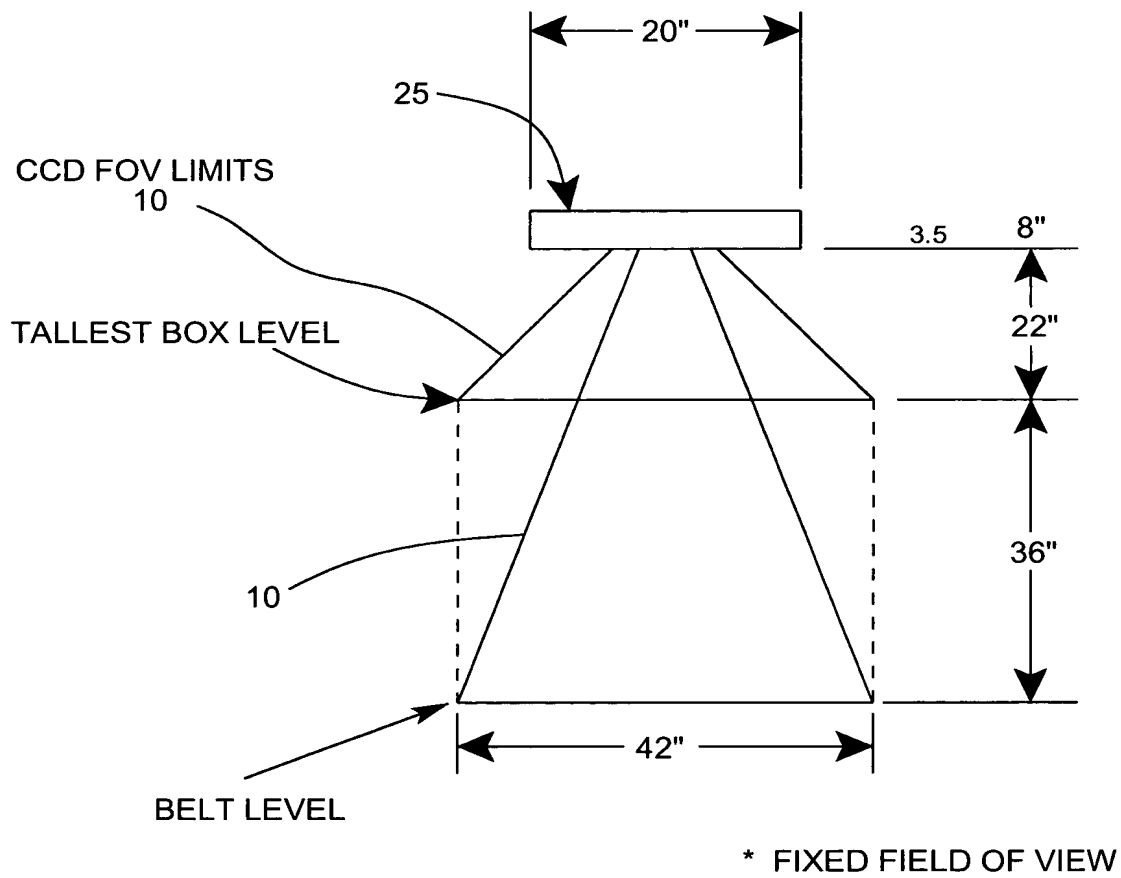
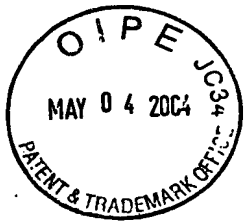


FIG. 1G5

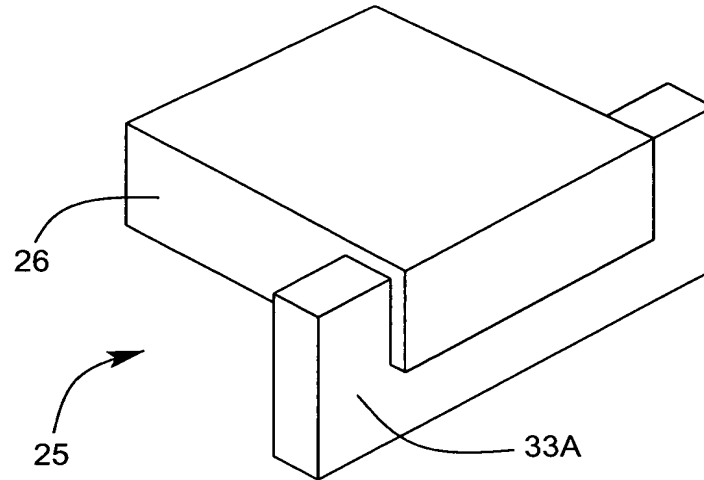


FIG. 1G6

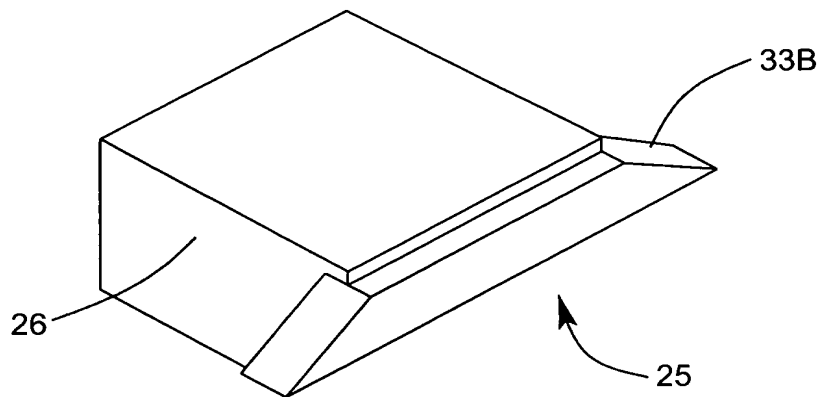


FIG. 1G7

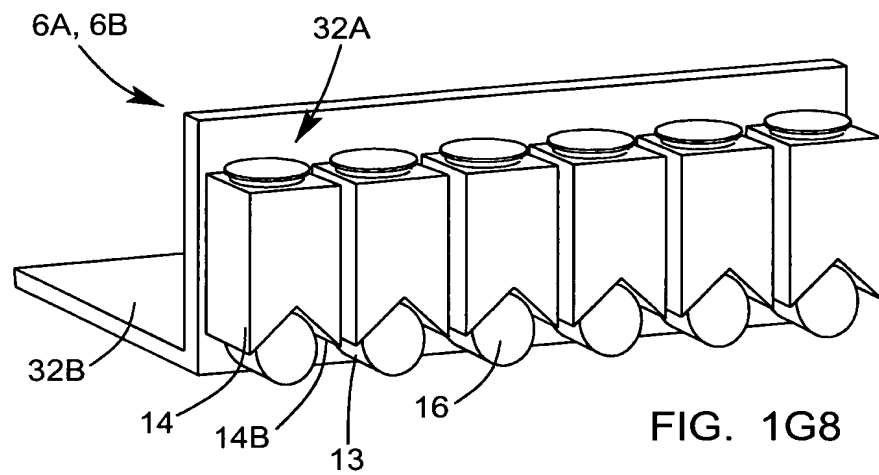


FIG. 1G8

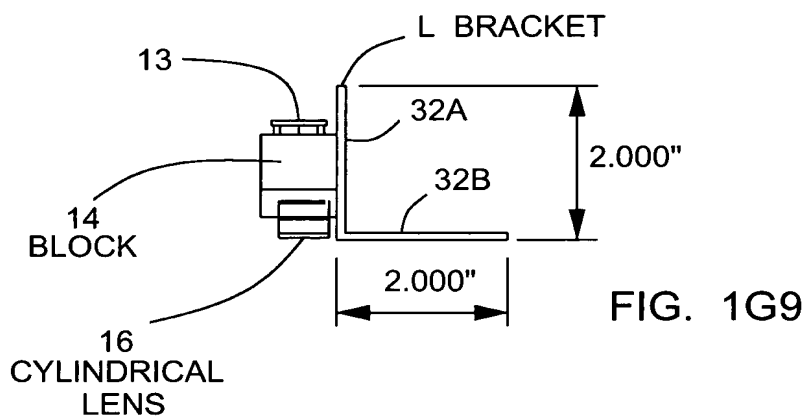


FIG. 1G9

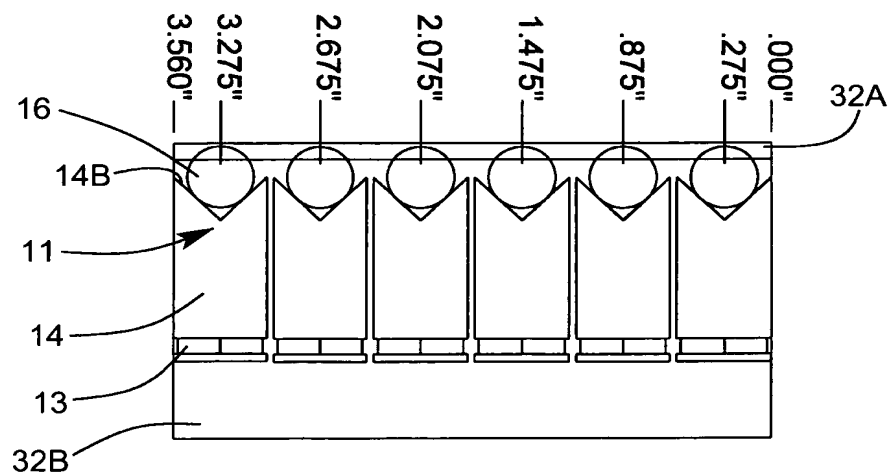


FIG. 1G10

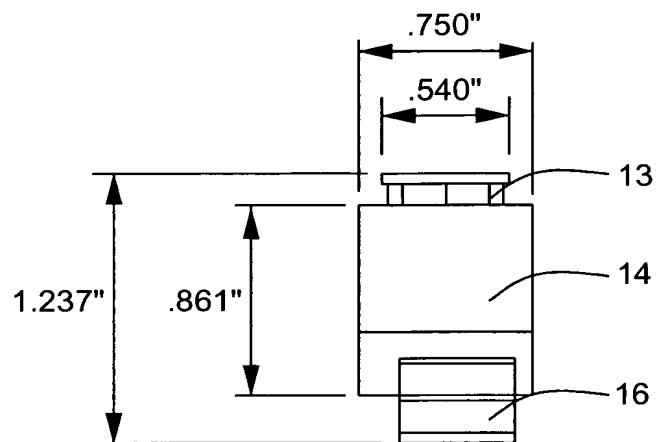


FIG. 1G11

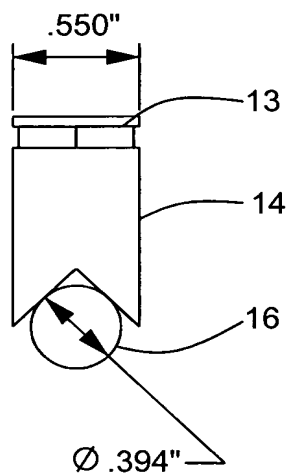


FIG. 1G12

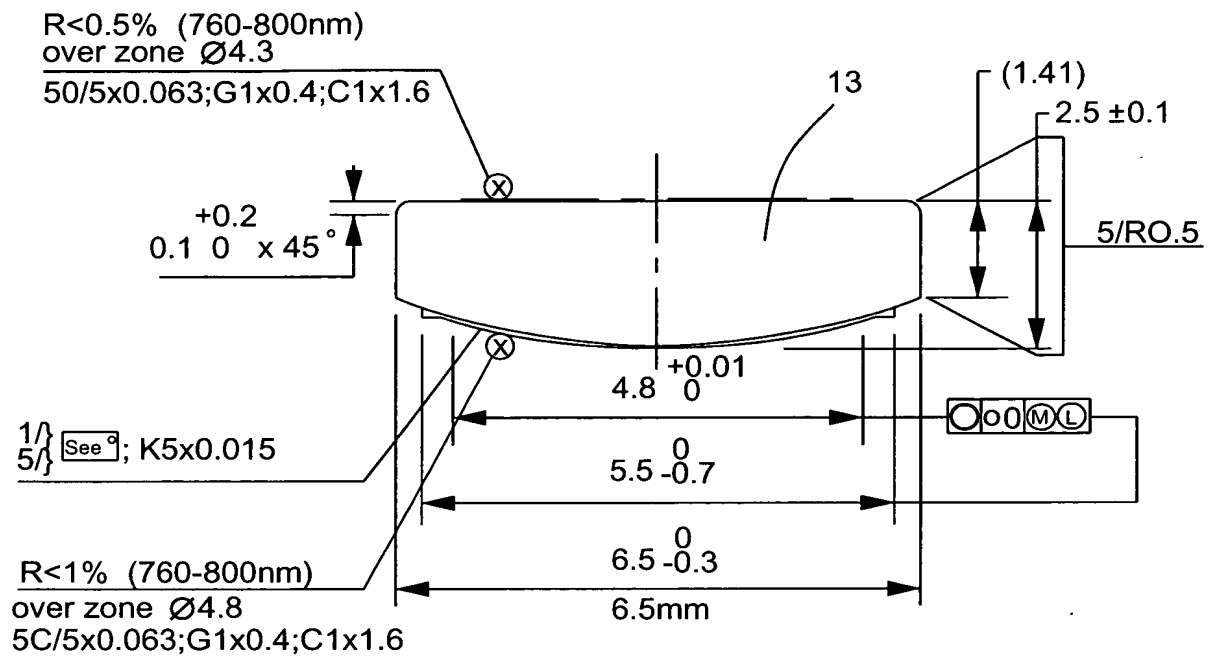


FIG. 1G13

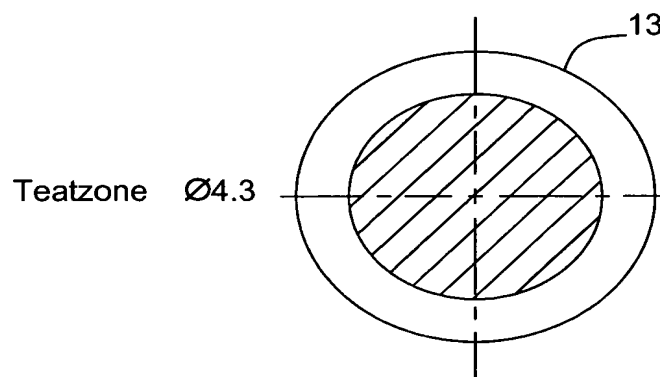


FIG. 1G14

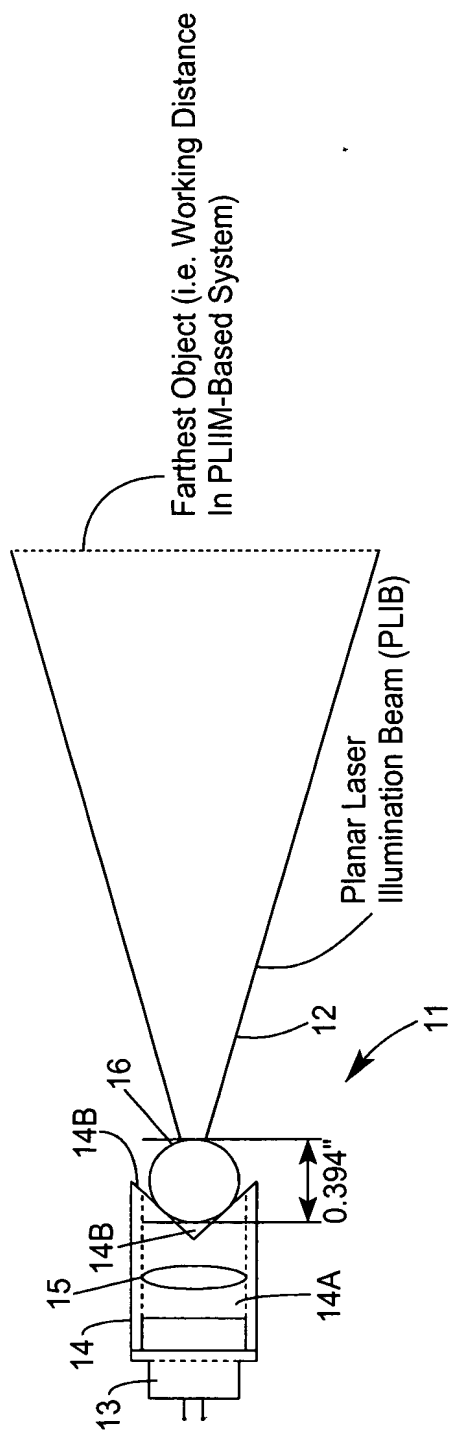


FIG. 1G15A

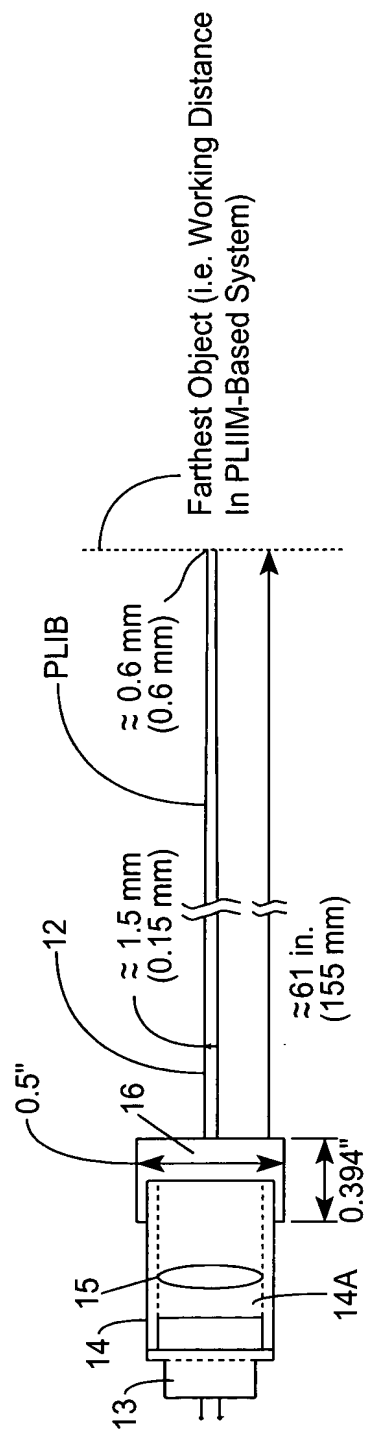


FIG. 1G15B

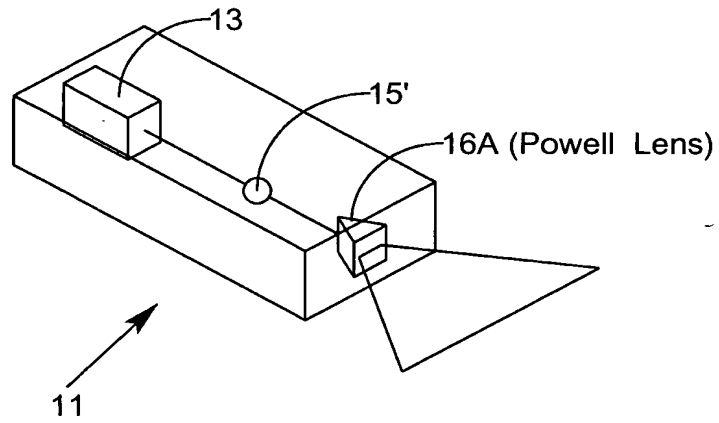


FIG. 1G16A

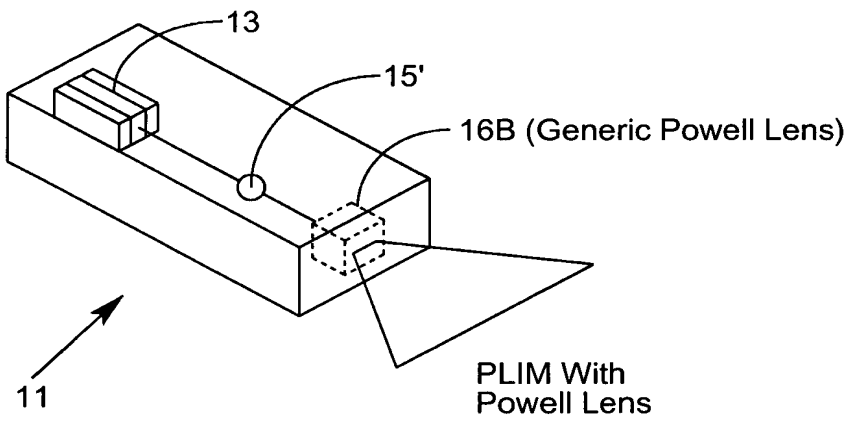
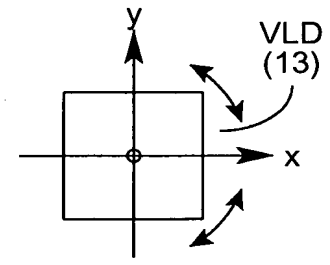
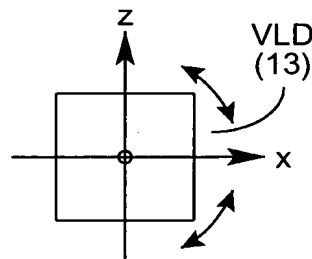
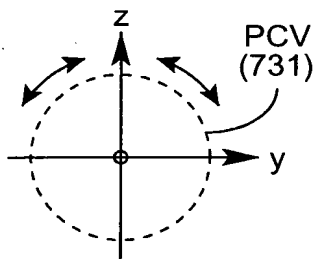
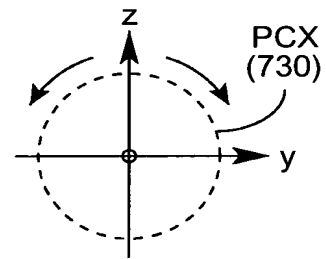
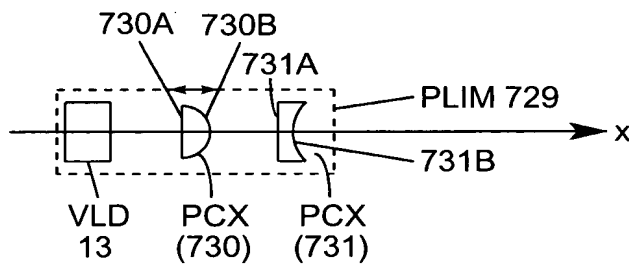
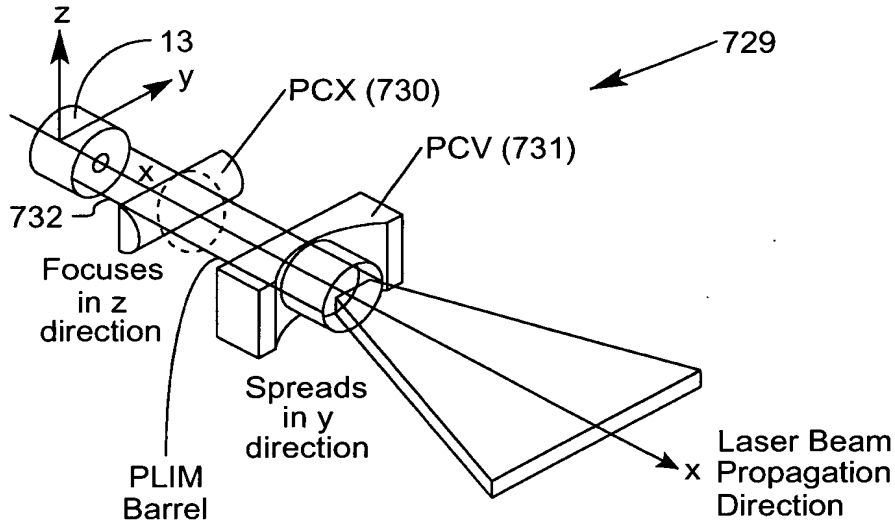


FIG. 1G16B



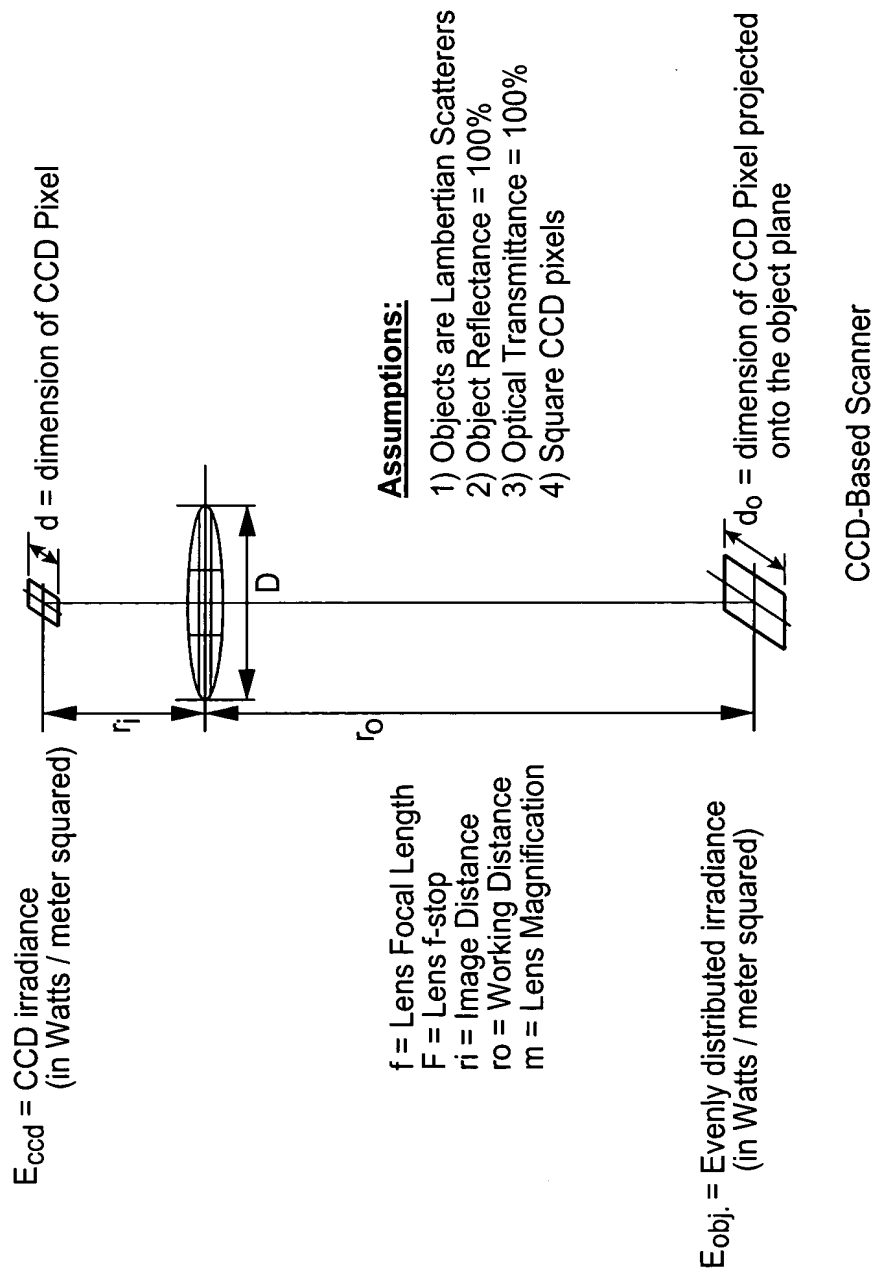


FIG. 1H6

FIRST GENERALIZED METHOD OF REDUCING
 SPECKLE-NOISE PATTERNS AT IMAGE DETECTION
 ARRAY OF THE IFD SUBSYSTEM (3)

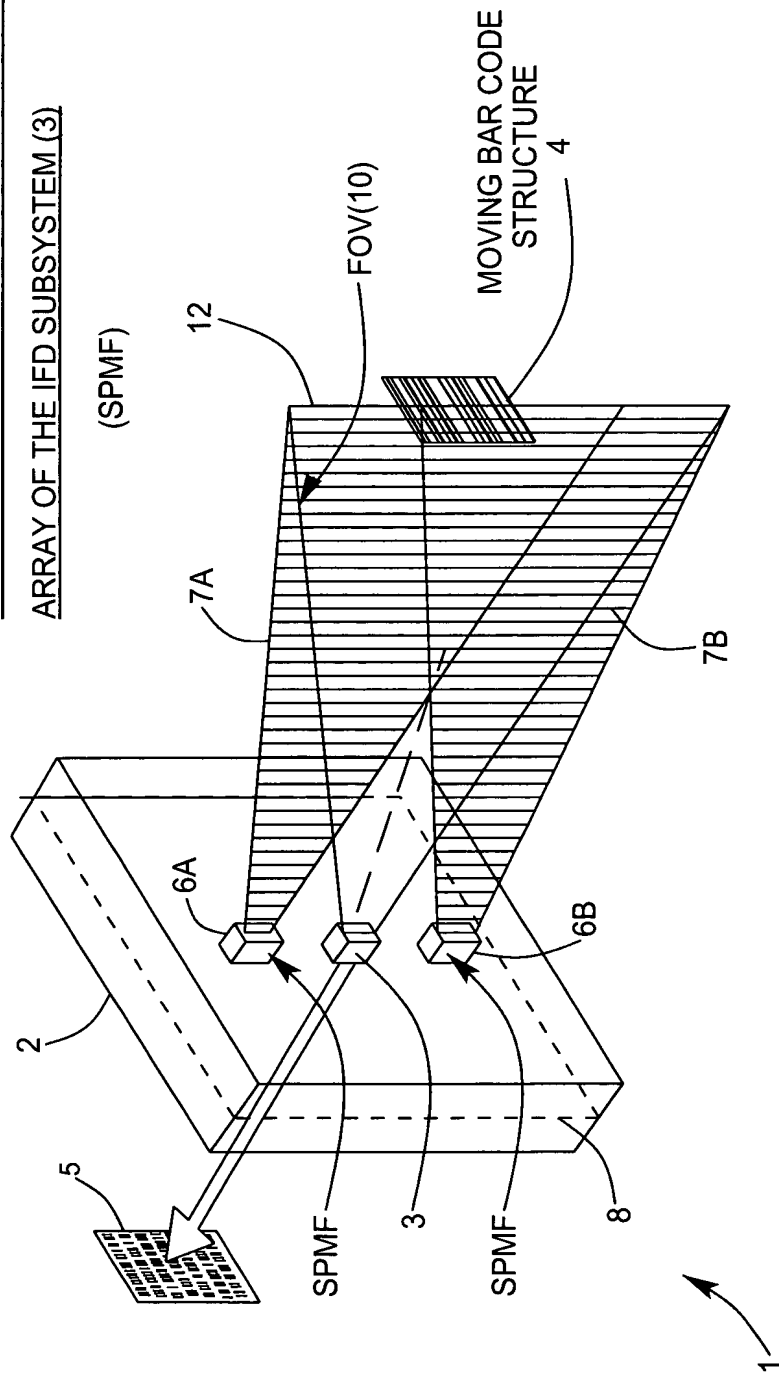


FIG. 111

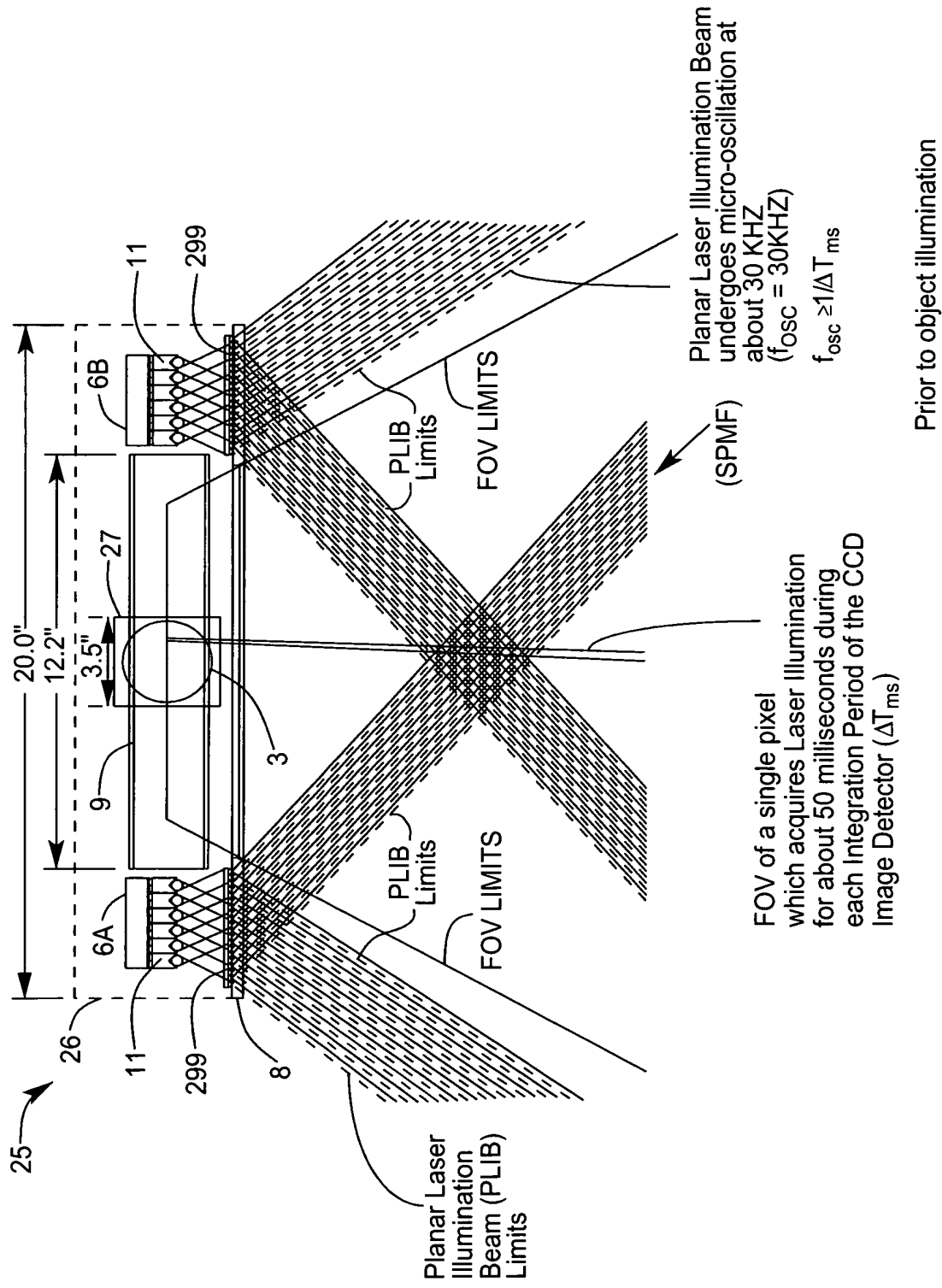


FIG. 112A



THE FIRST GENERALIZED SPECKLE-NOISE PATTERN REDUCTION
METHOD OF THE PRESENT INVENTION

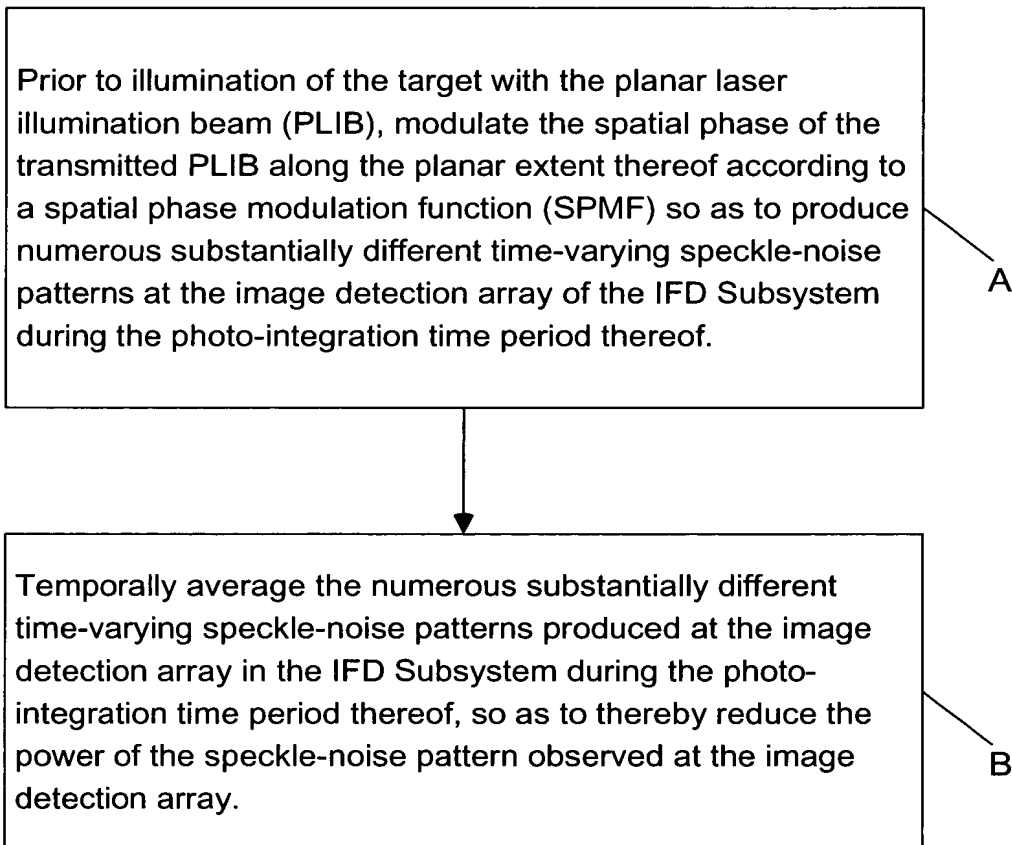
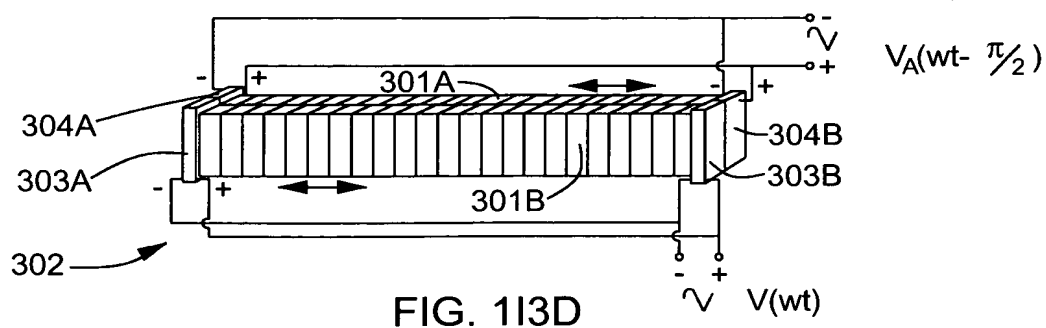
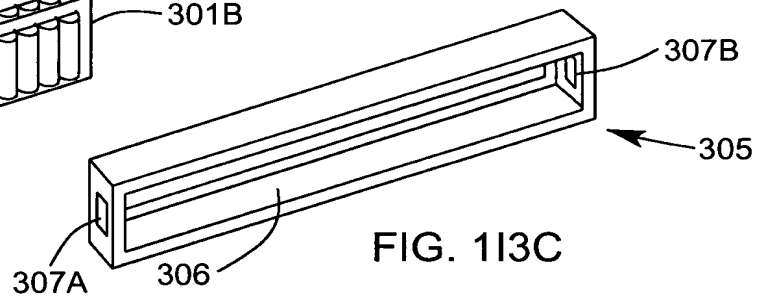
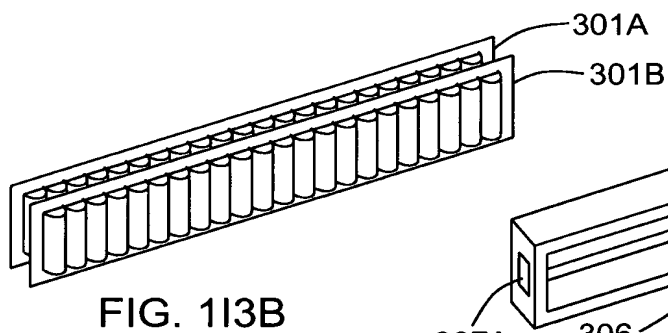
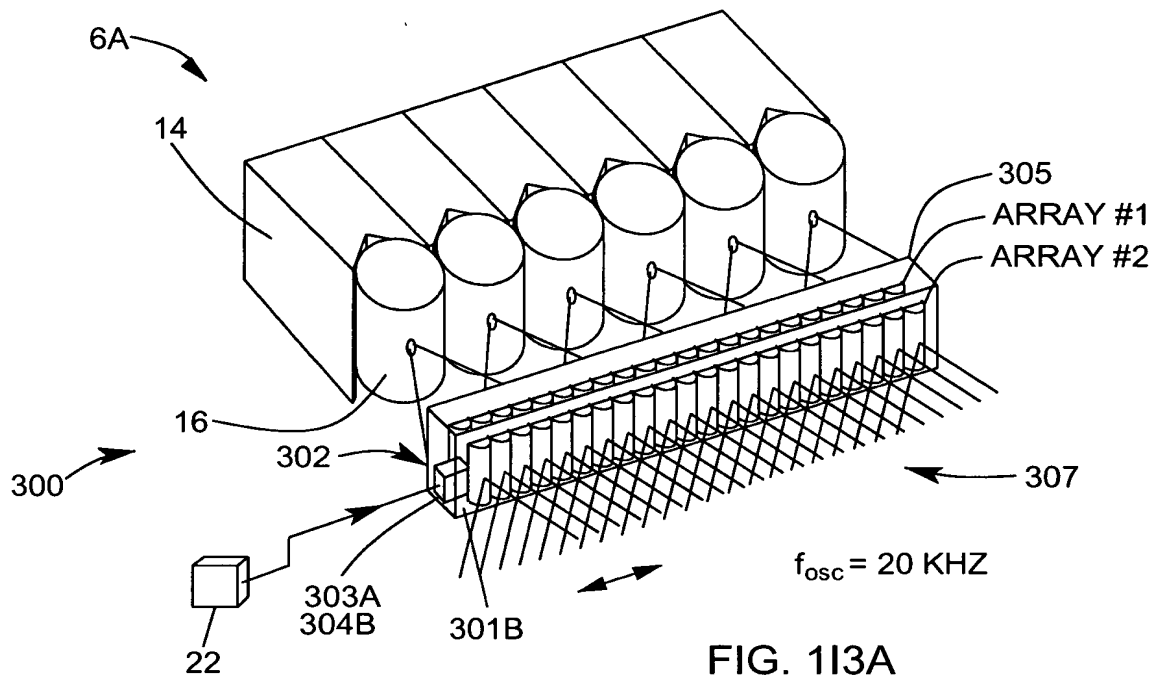
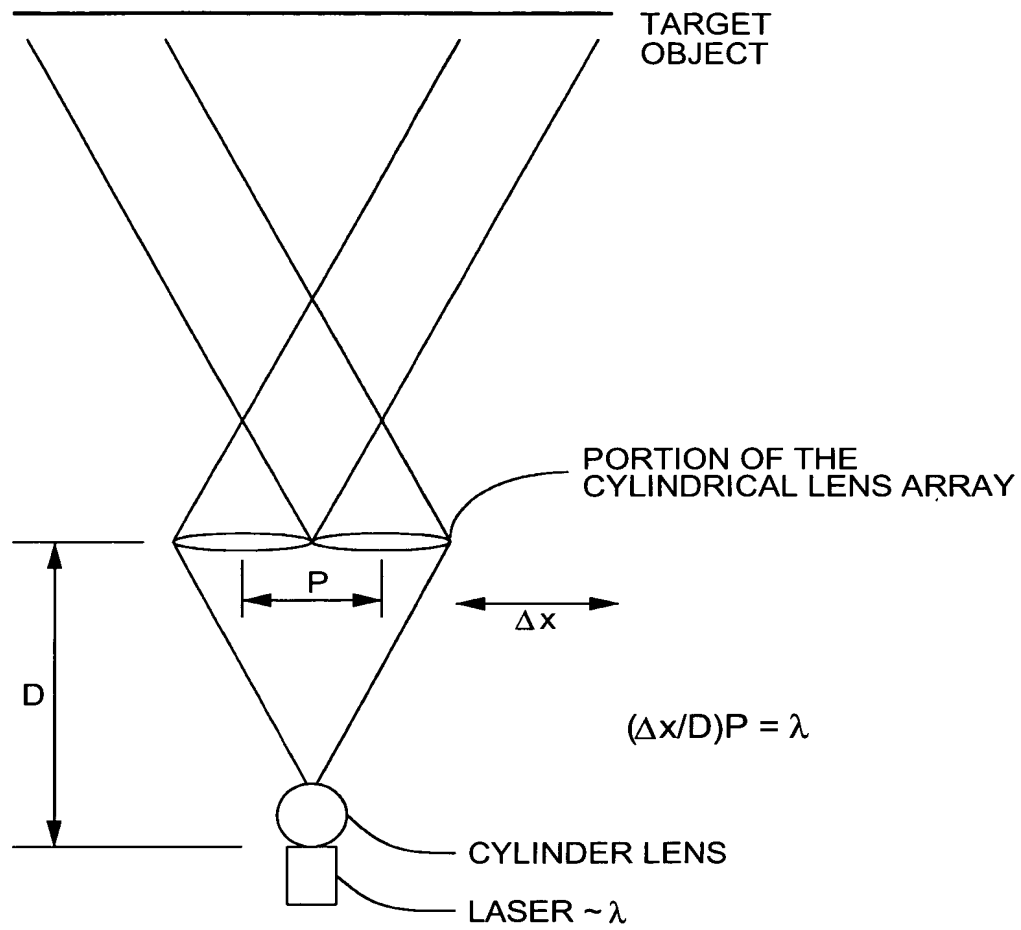


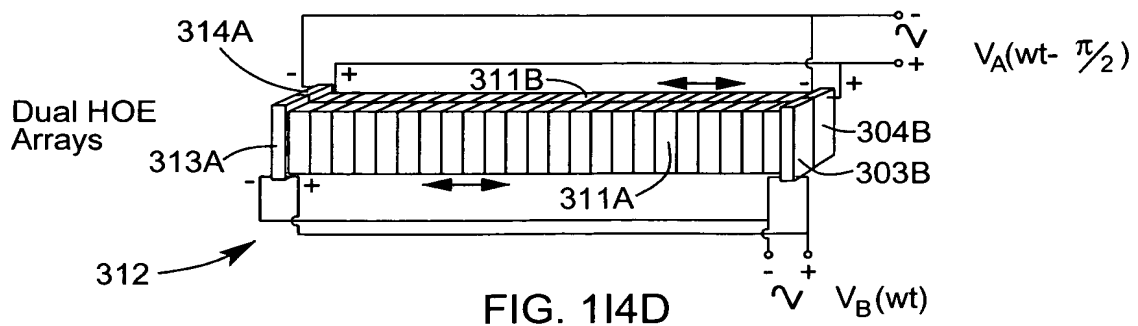
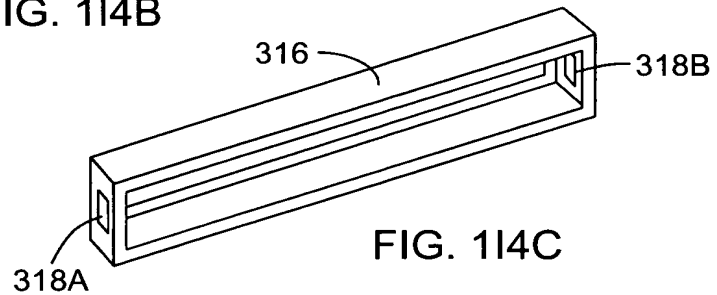
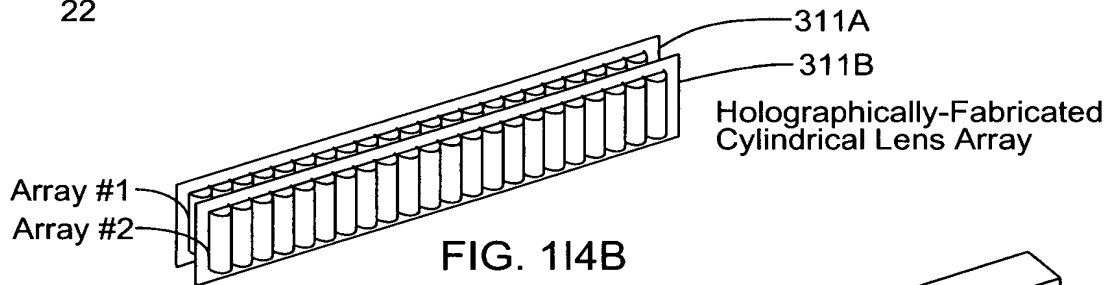
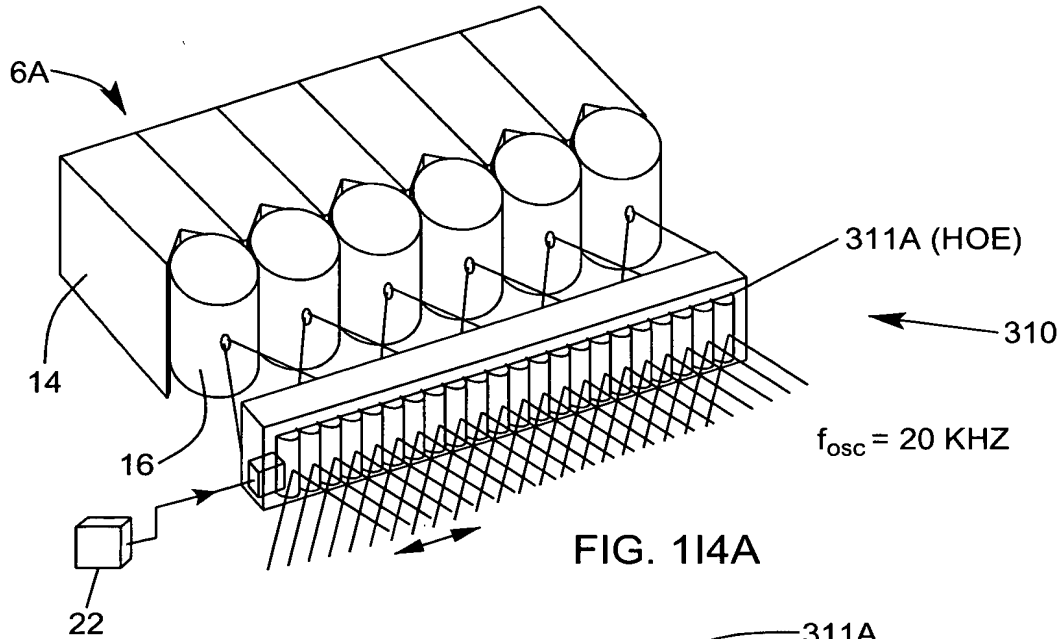
FIG. 112B





$$\Delta x \geq \frac{\lambda \cdot D}{P}$$

FIG. 113E



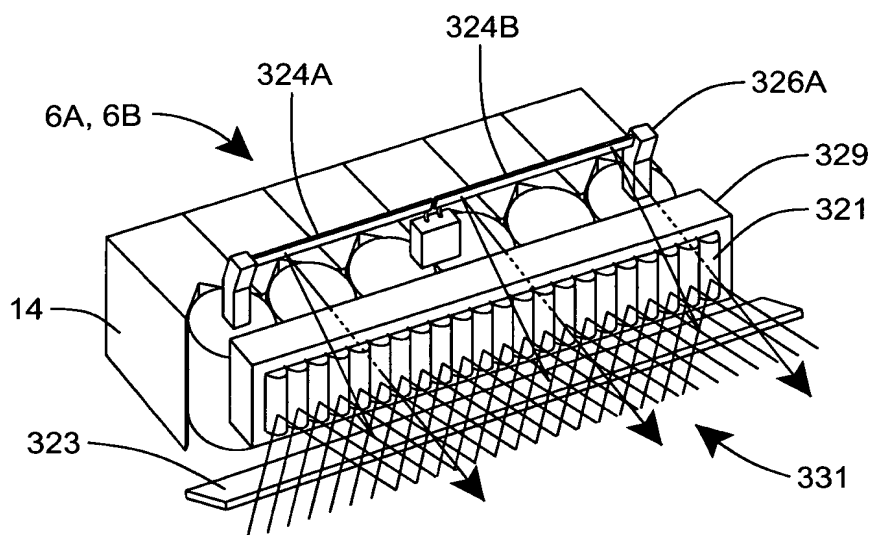


FIG. 115A

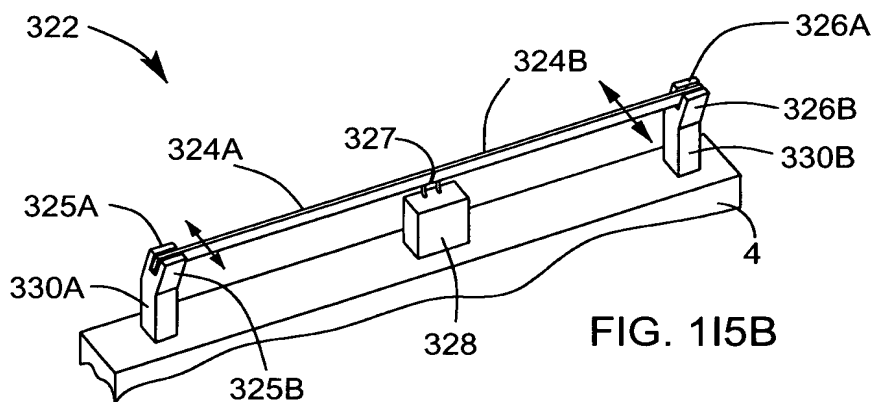


FIG. 115B

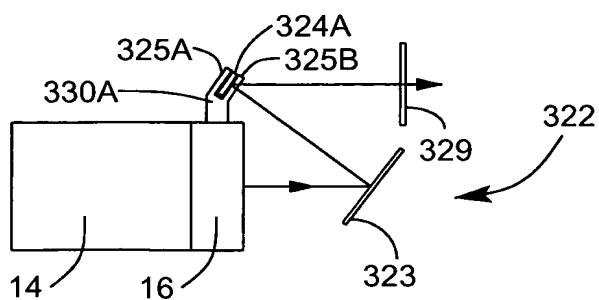


FIG. 115C

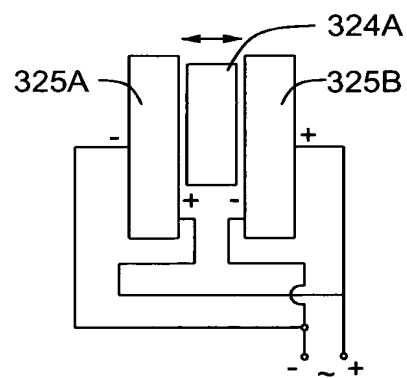


FIG. 115D

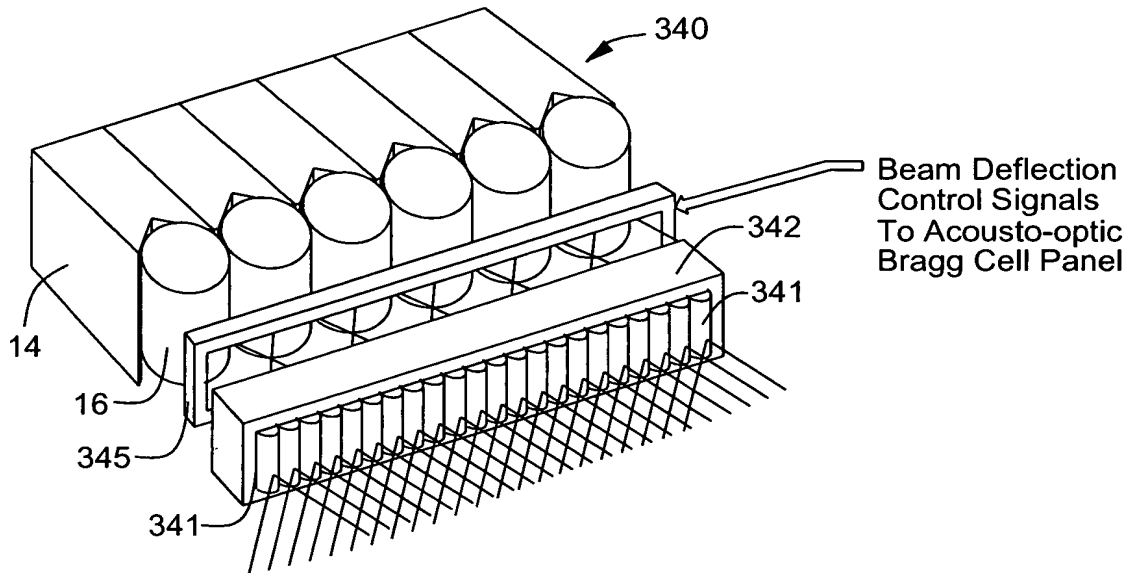


FIG. 116A

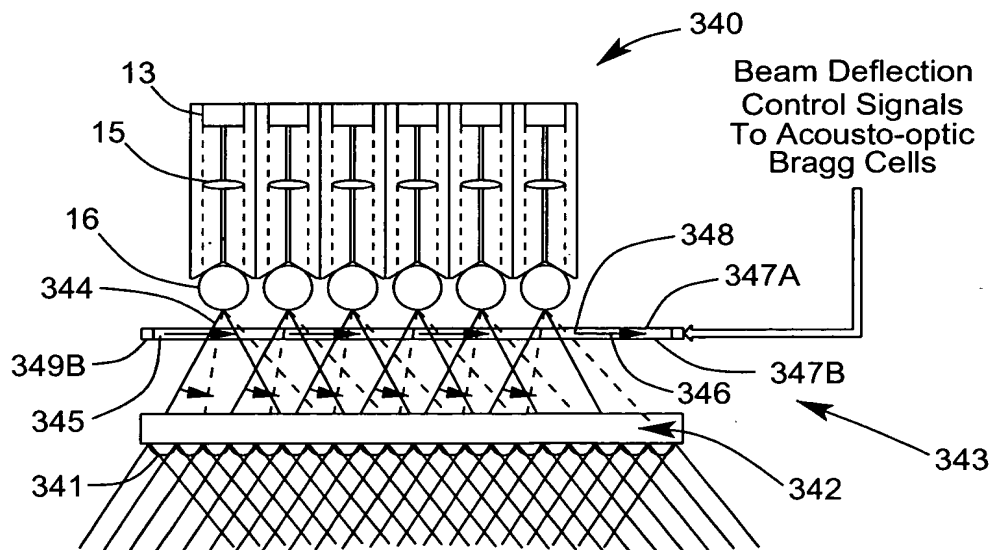


FIG. 116B

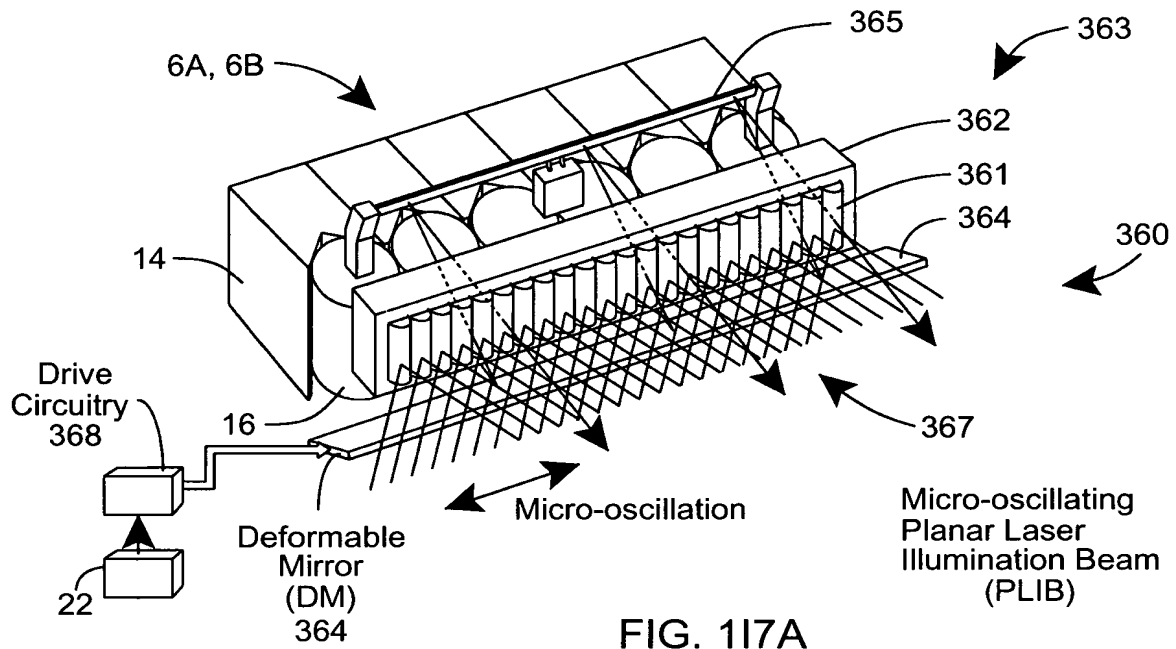


FIG. 117A

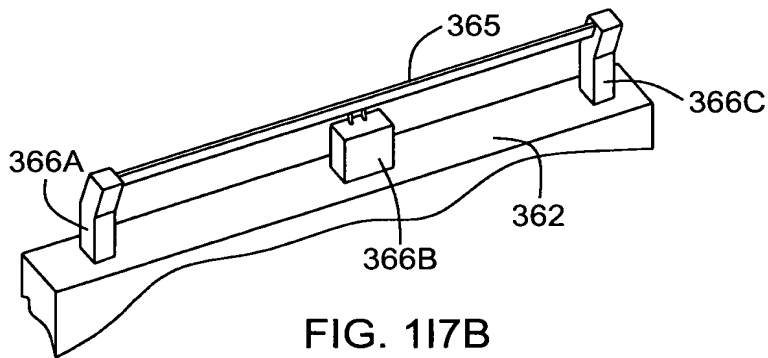


FIG. 117B

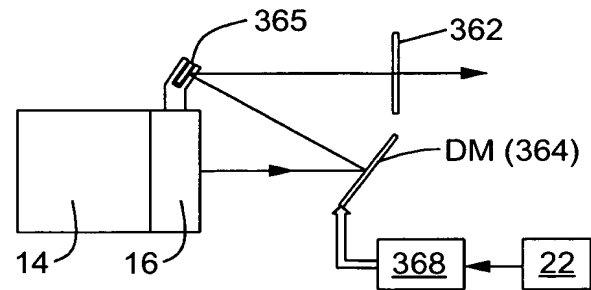


FIG. 117C

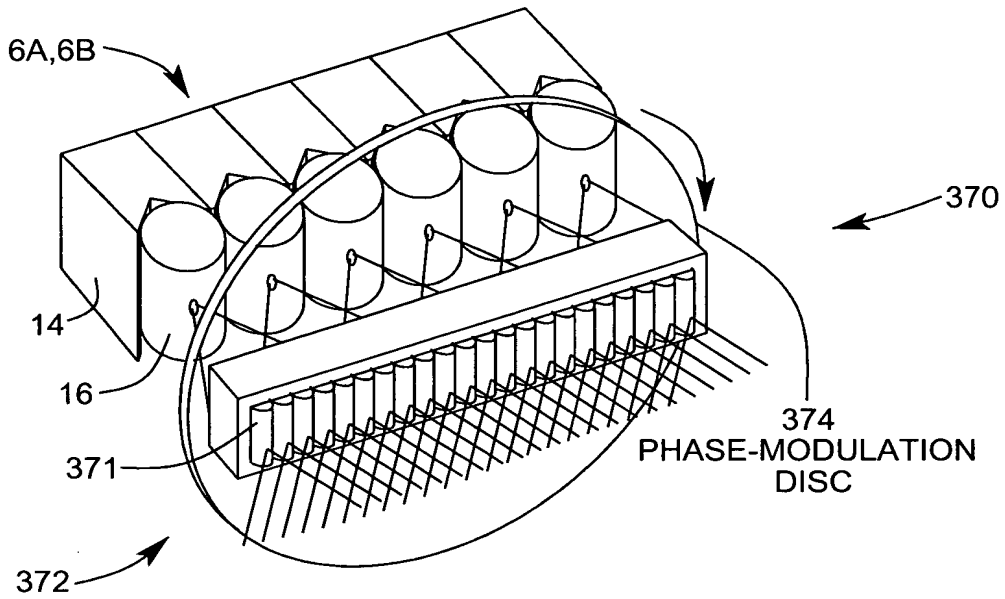


FIG. 118A

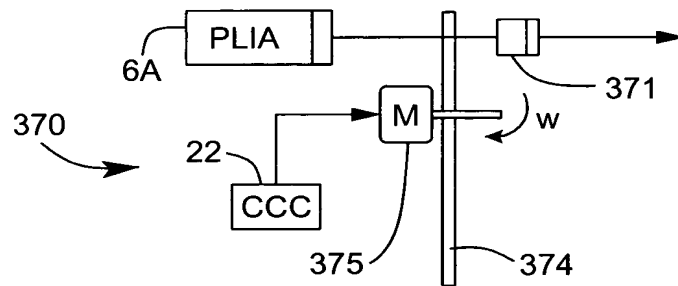


FIG. 118B

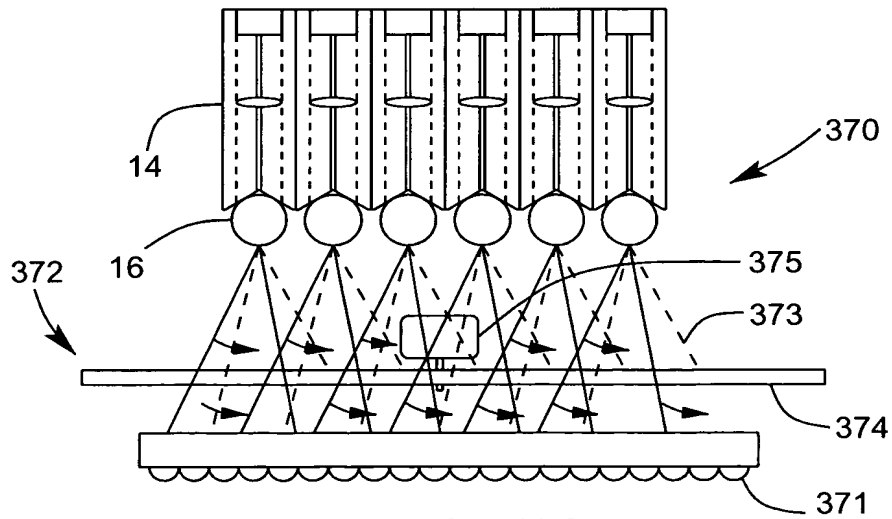


FIG. 118C

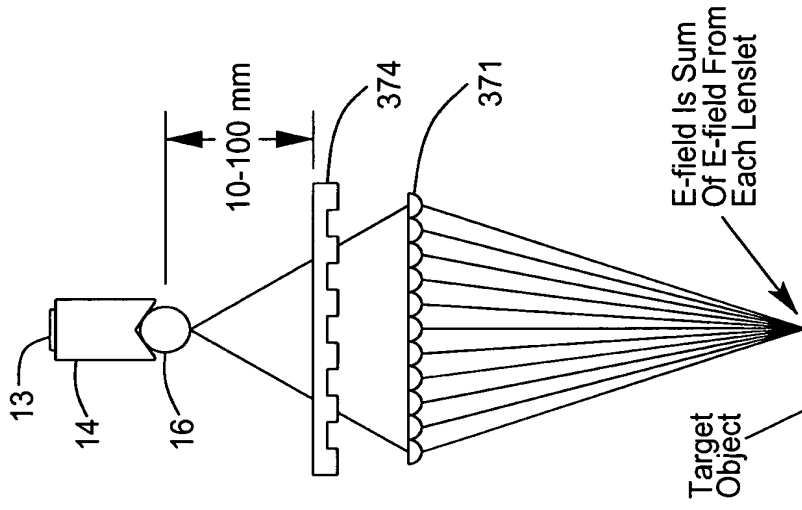


FIG. 118E

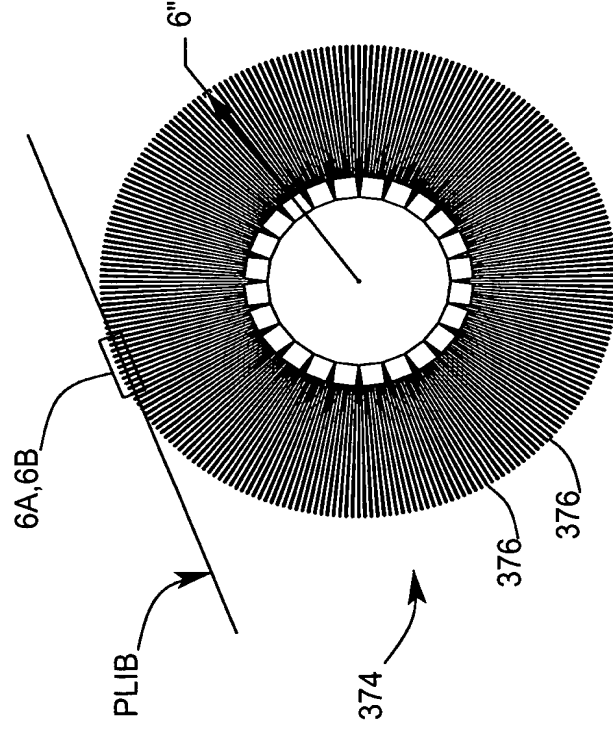
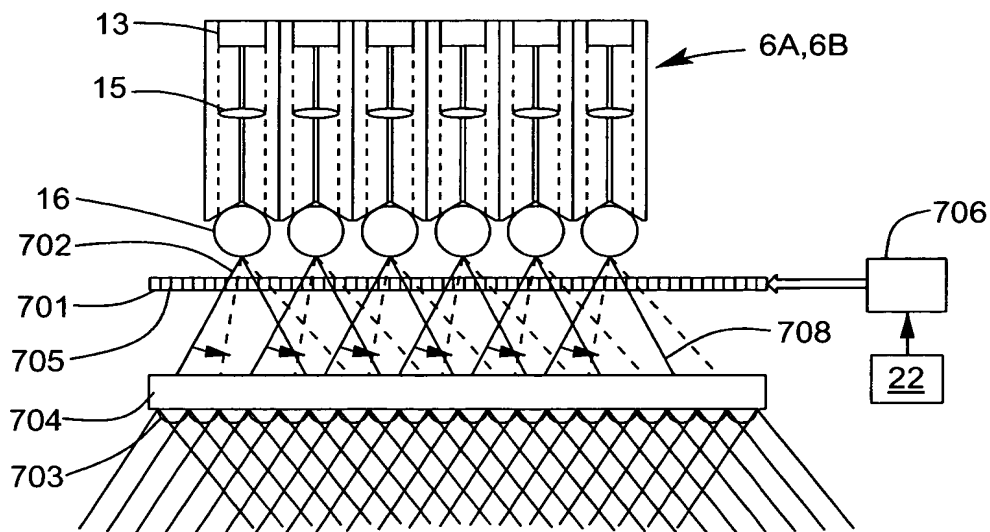
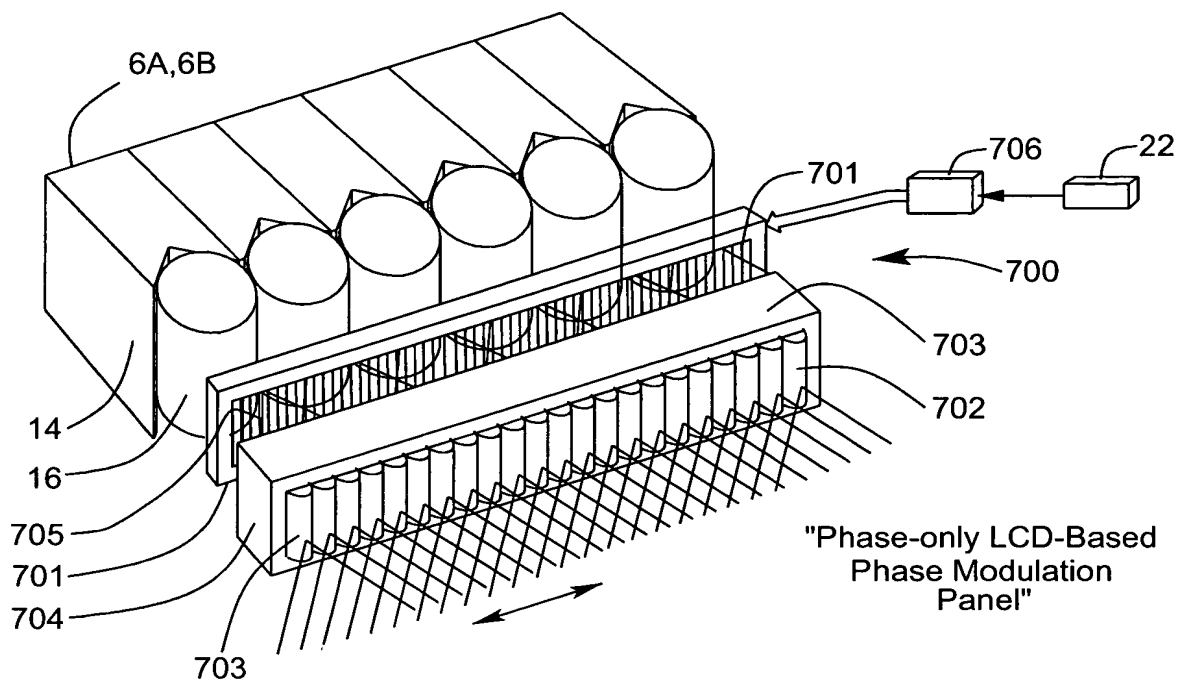


FIG. 118D



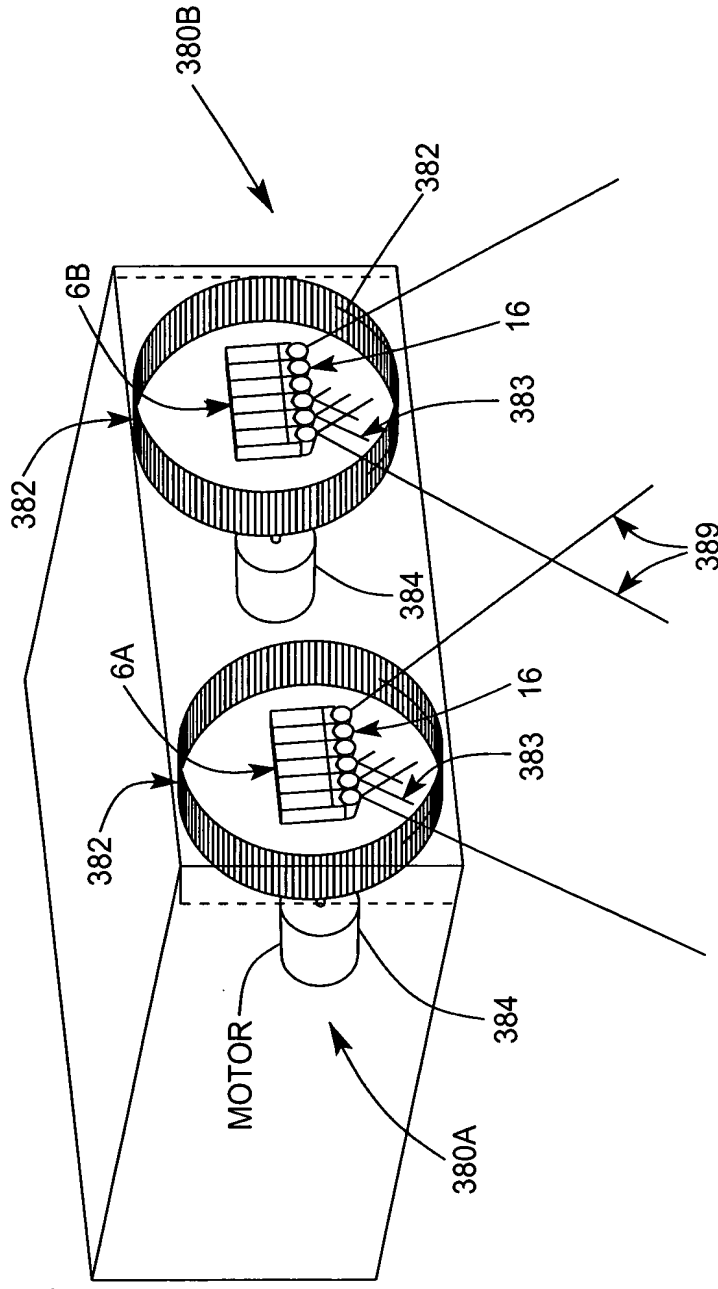
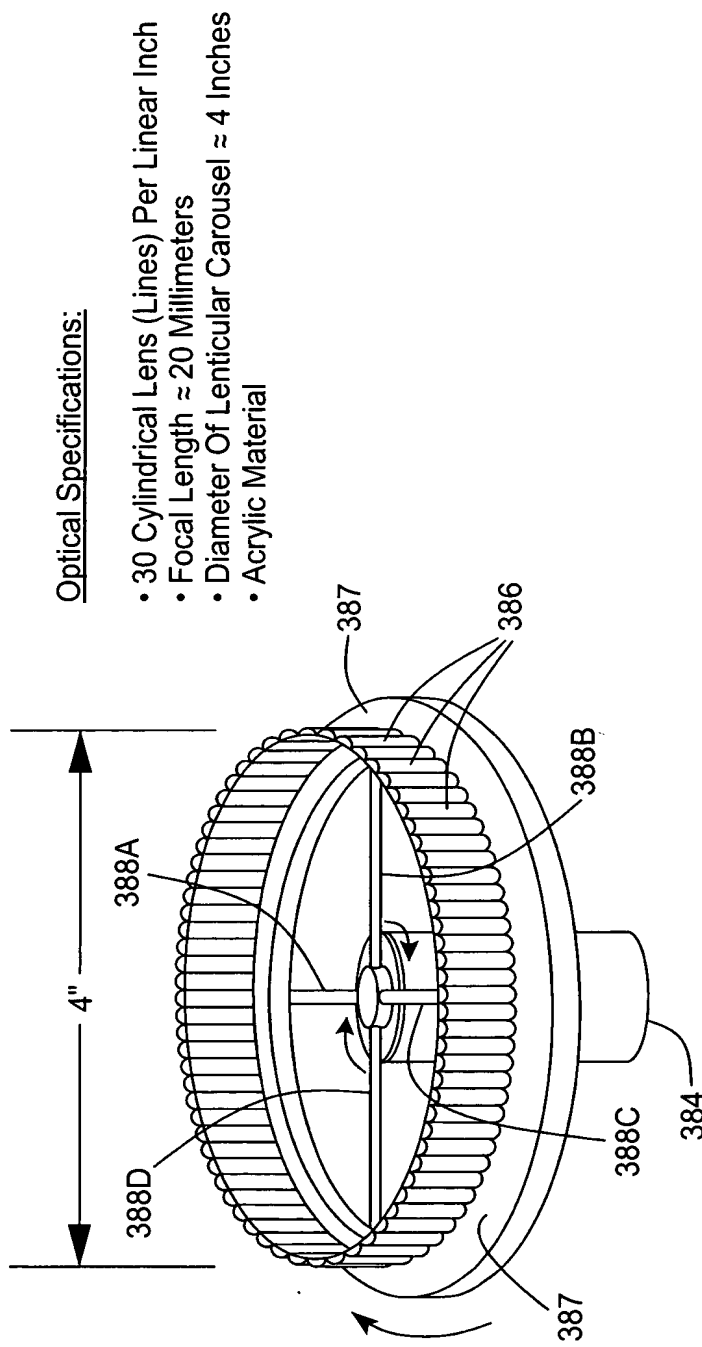


FIG. 119A



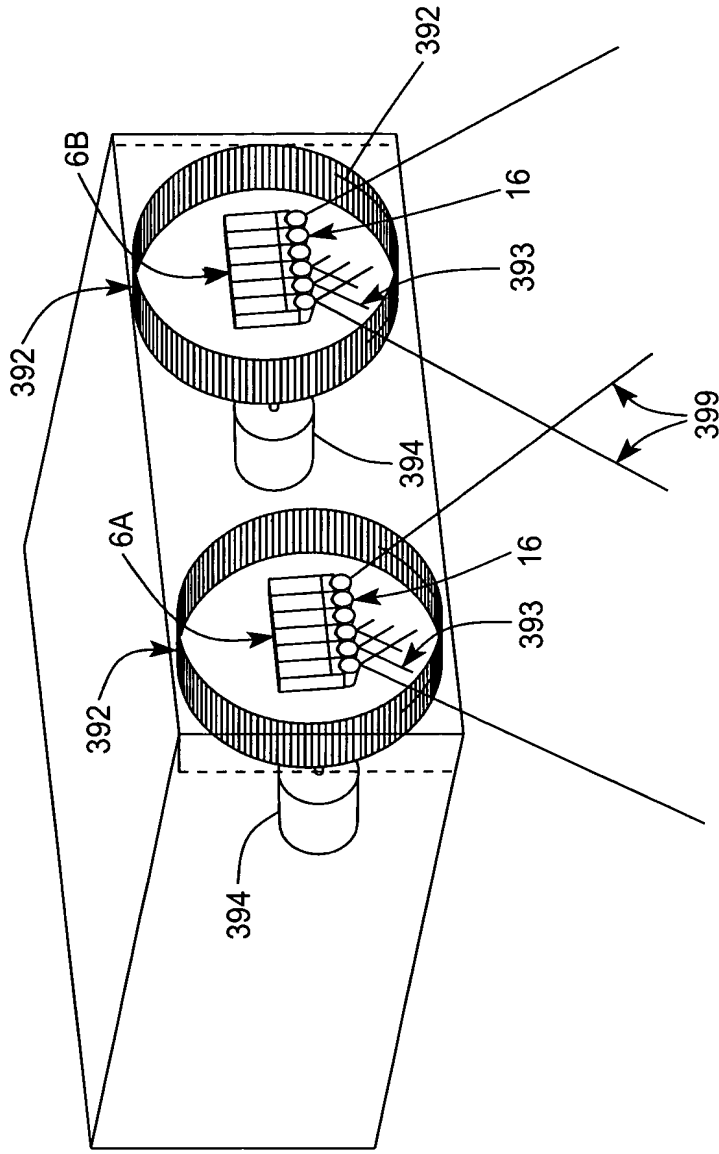
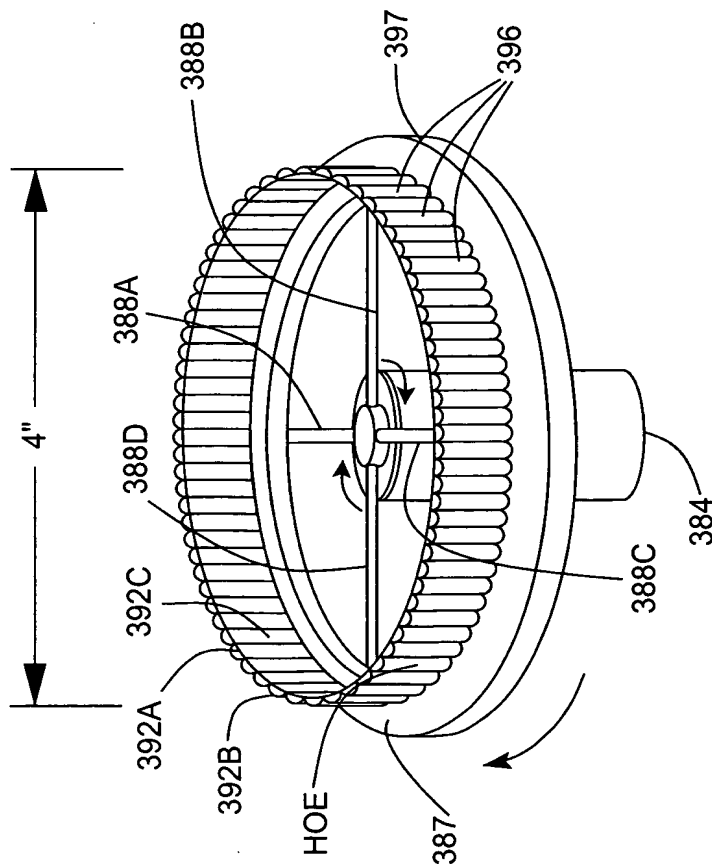


FIG. 1110A



Optical Specifications:

- 30 Cylindrical Lens (Lines) Per Linear Inch
- Focal Length \approx 20 Millimeters
- Diameter Of Lenticular Carousel \approx 4 Inches

FIG. 1110B

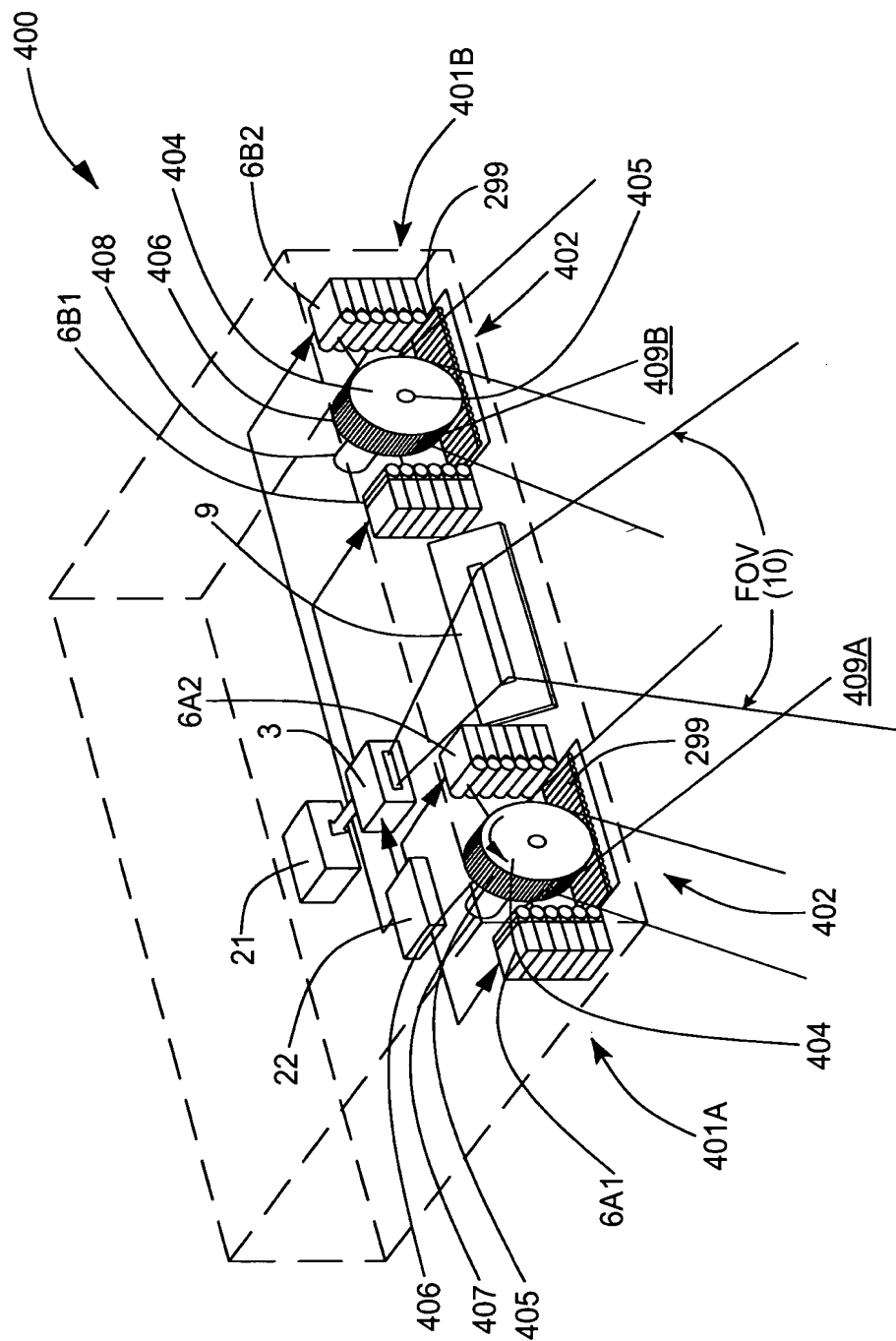


FIG. 1111A

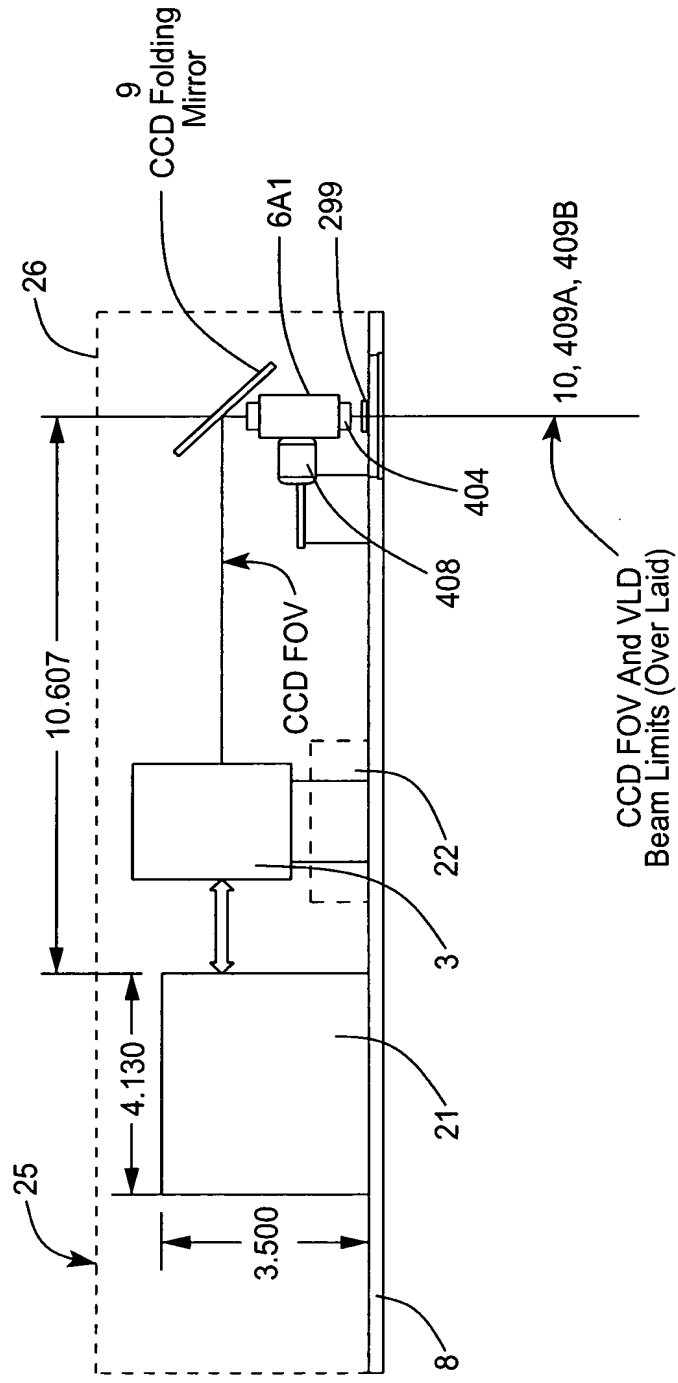


FIG. 1111B

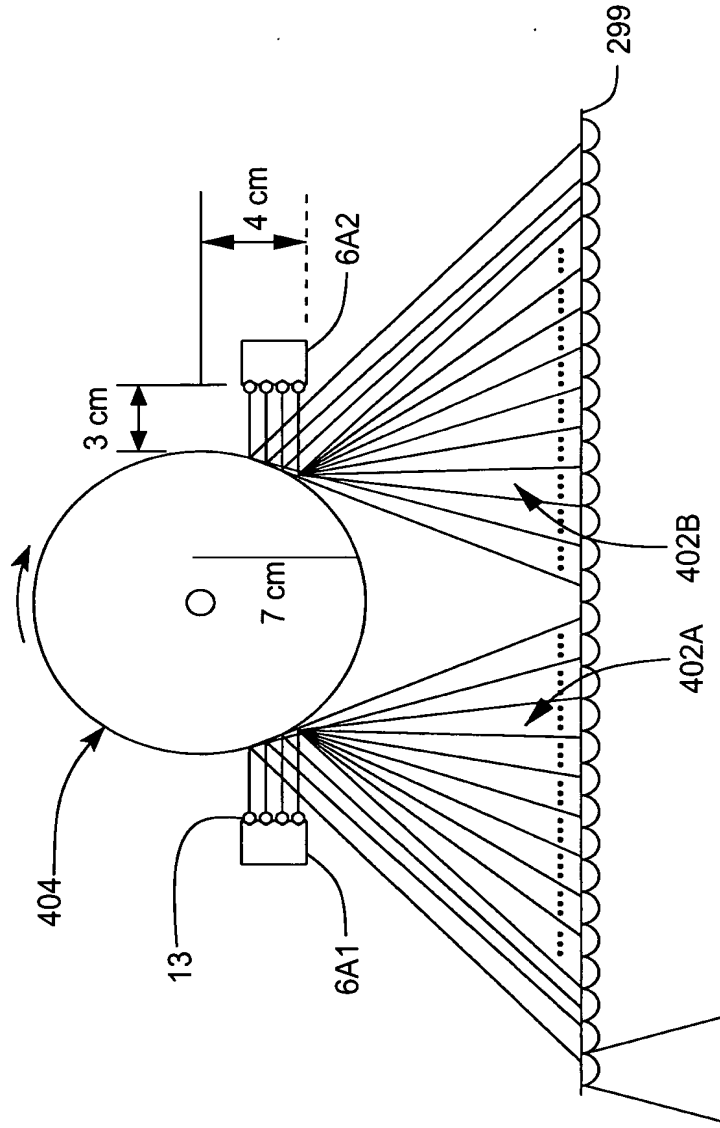


FIG. 1111C

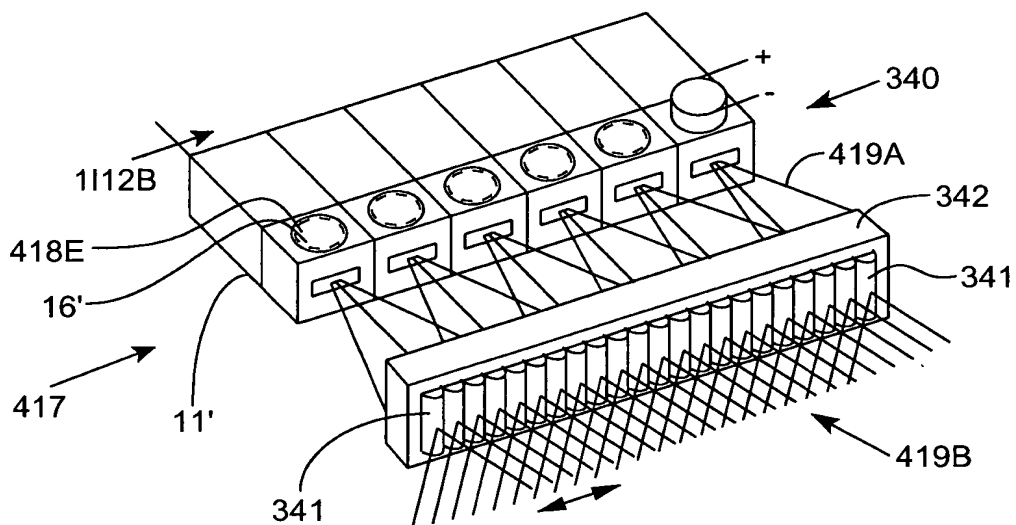


FIG. 1112A

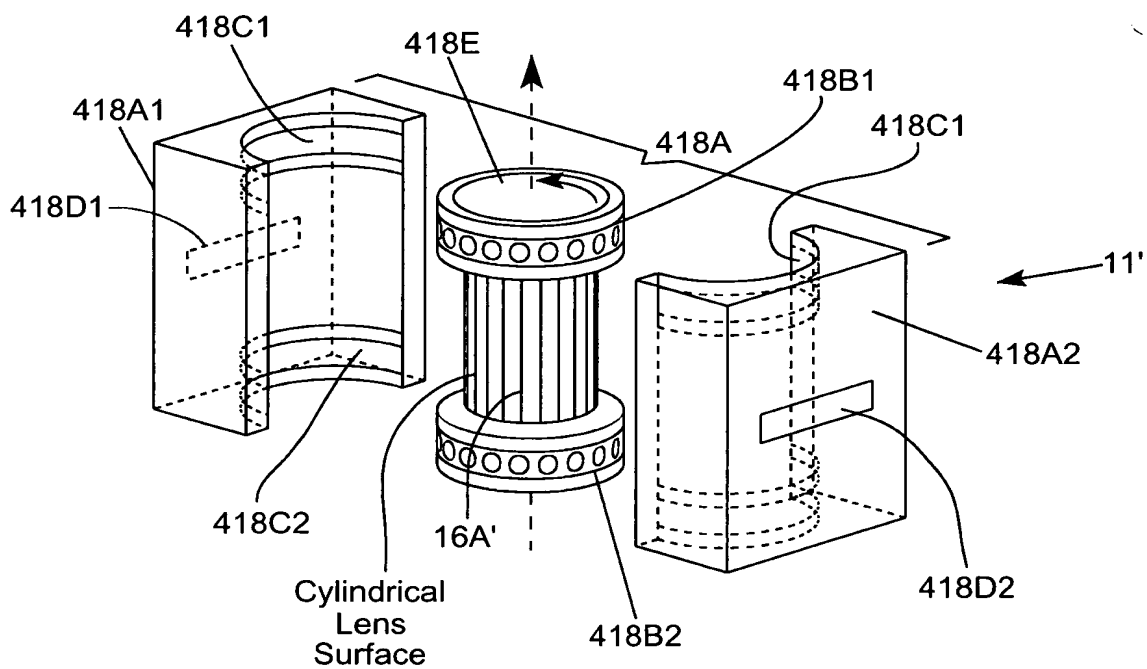


FIG. 1112B

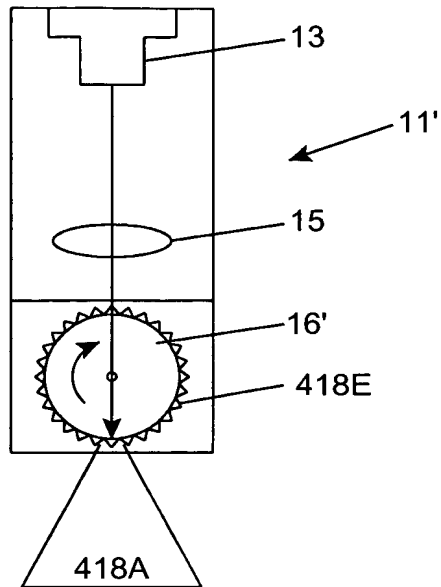


FIG. 1112C

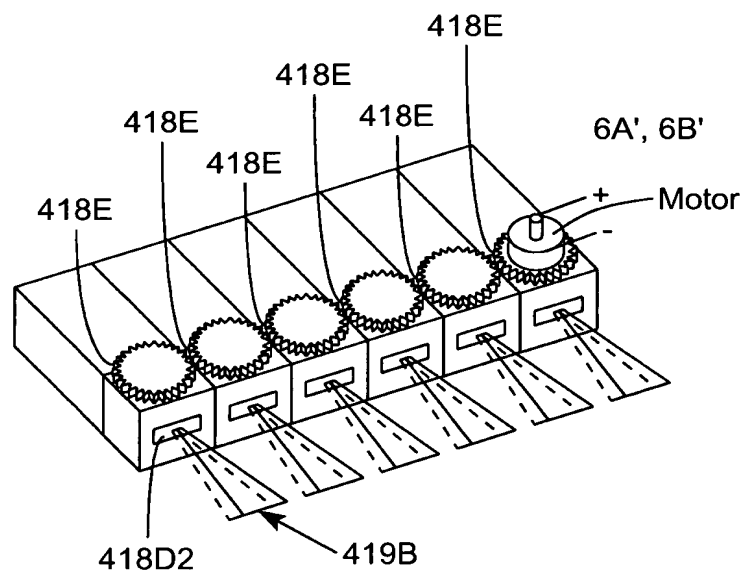


FIG. 1112D

Second Generalized Method Of
Reducing Speckle-Noise Patterns
At Image Detection Array
Of The IFD Subsystem (3)

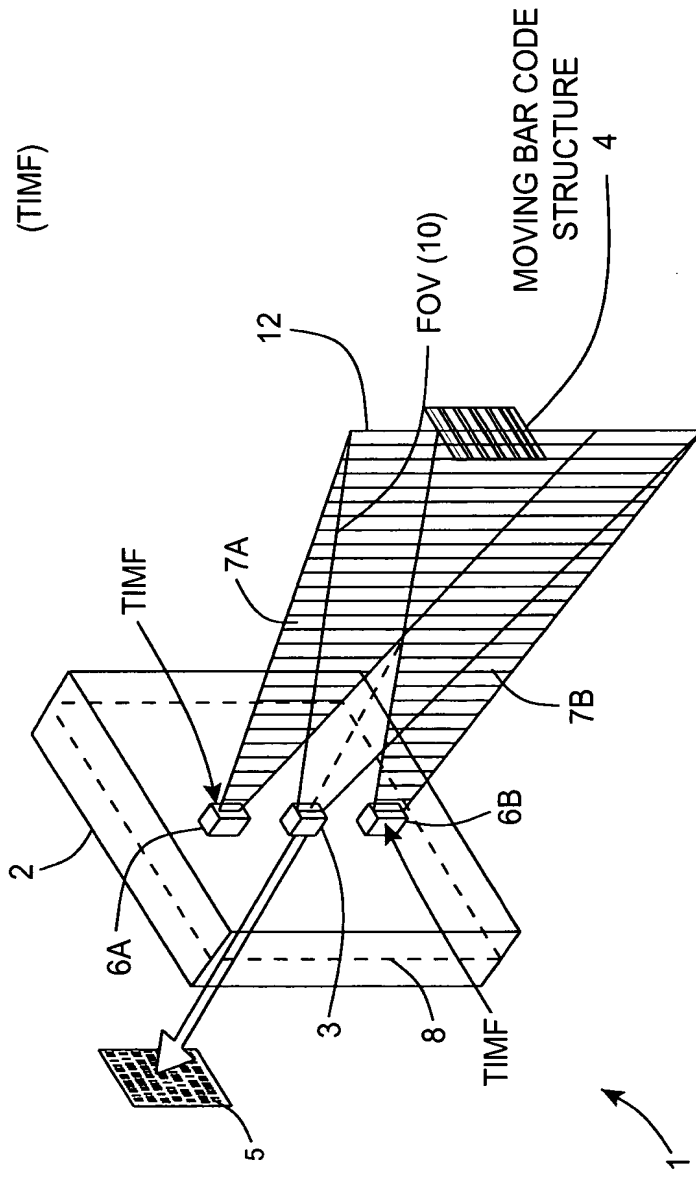


FIG. 1113

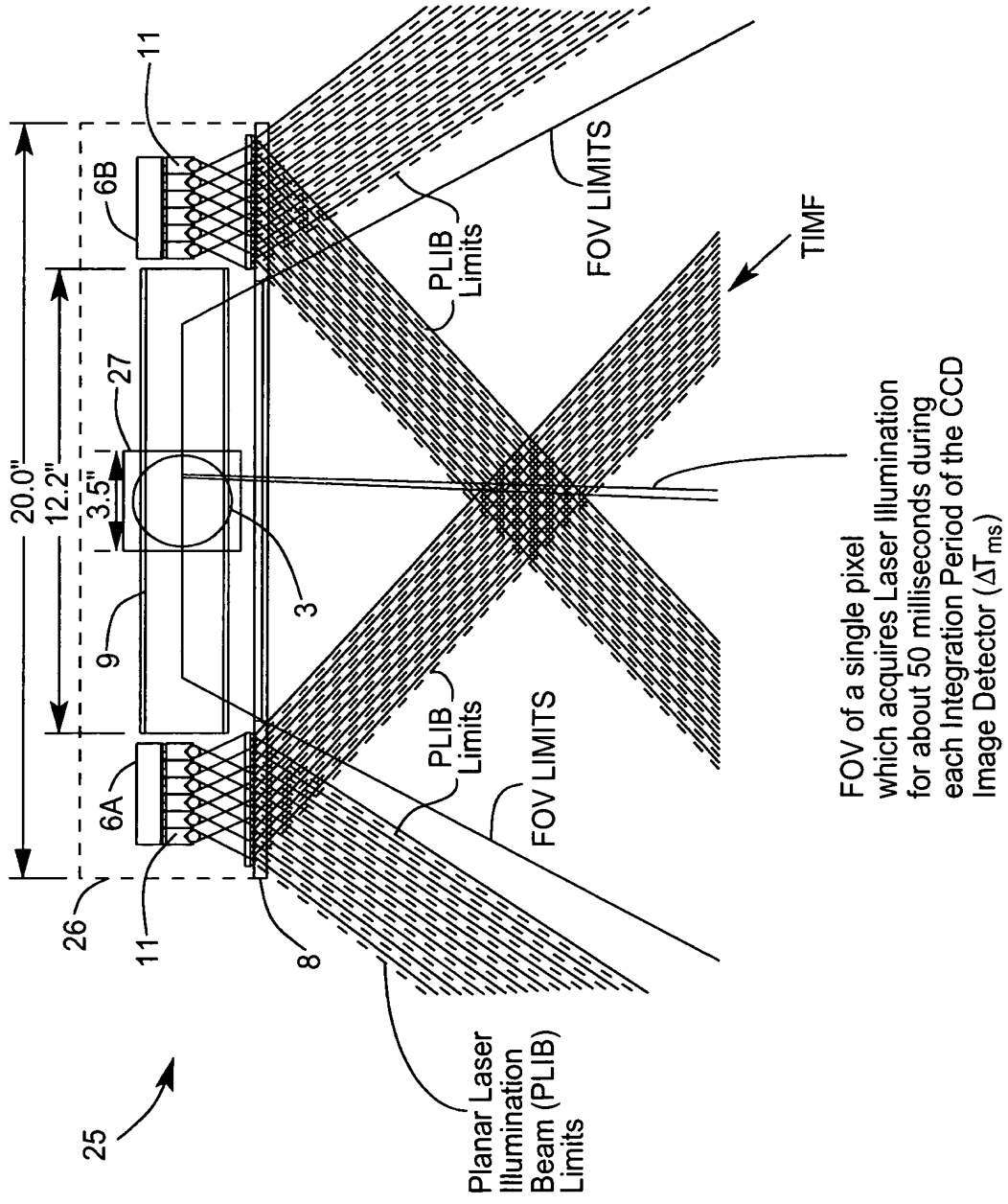
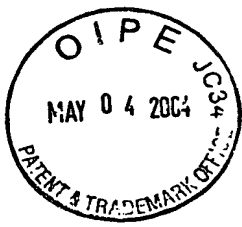


FIG. 1113A



THE SECOND GENERALIZED SPECKLE-NOISE PATTERN REDUCTION
METHOD OF THE PRESENT INVENTION

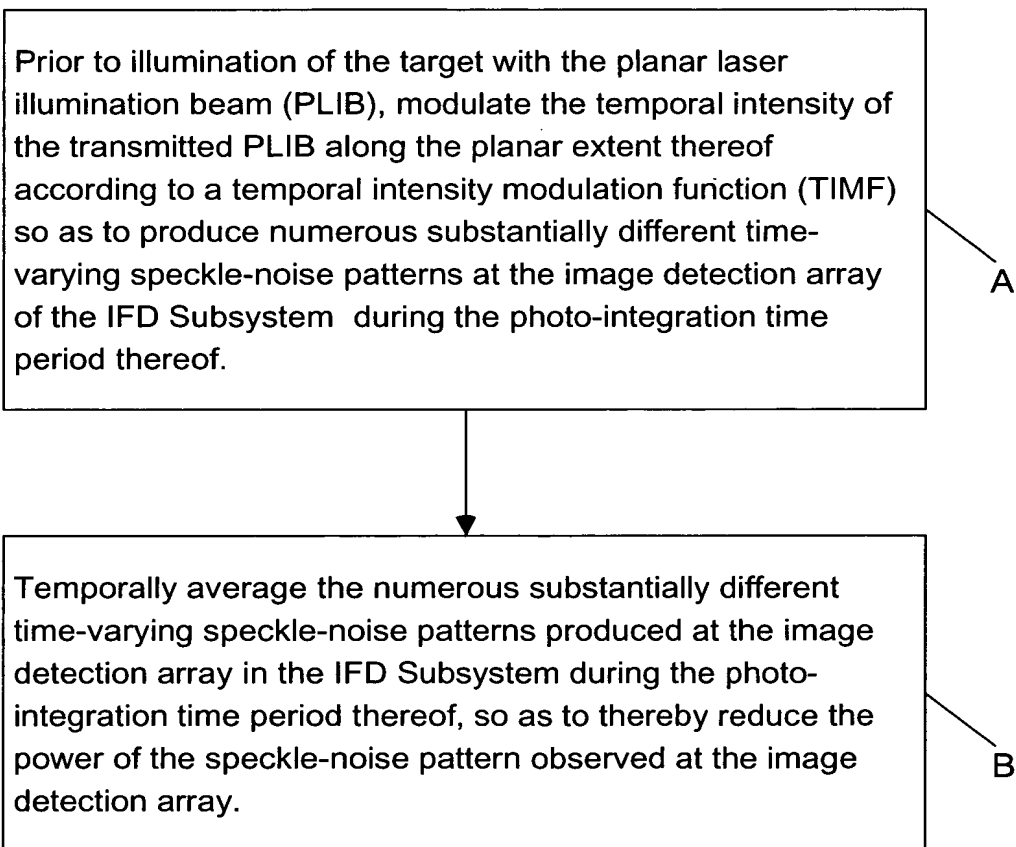


FIG. 1113B

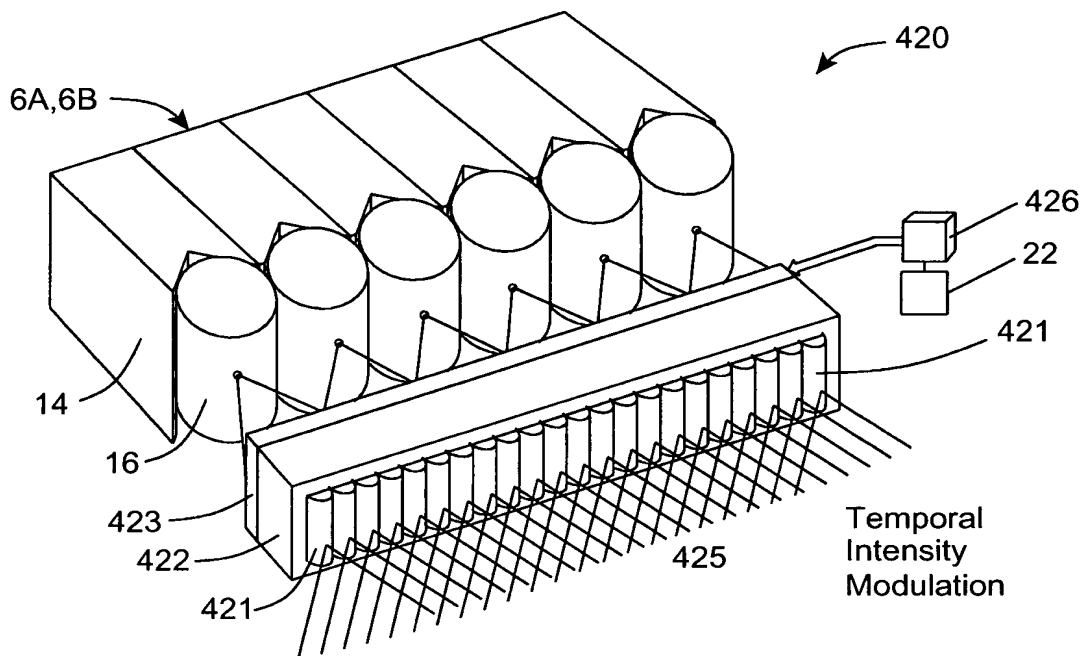


FIG. 1114A

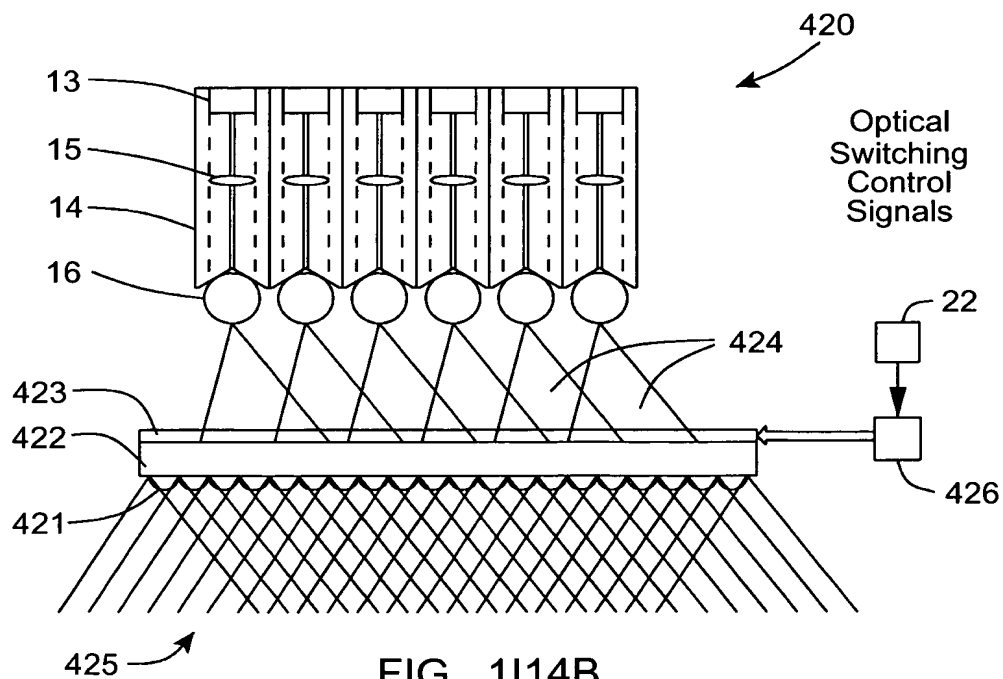


FIG. 1114B

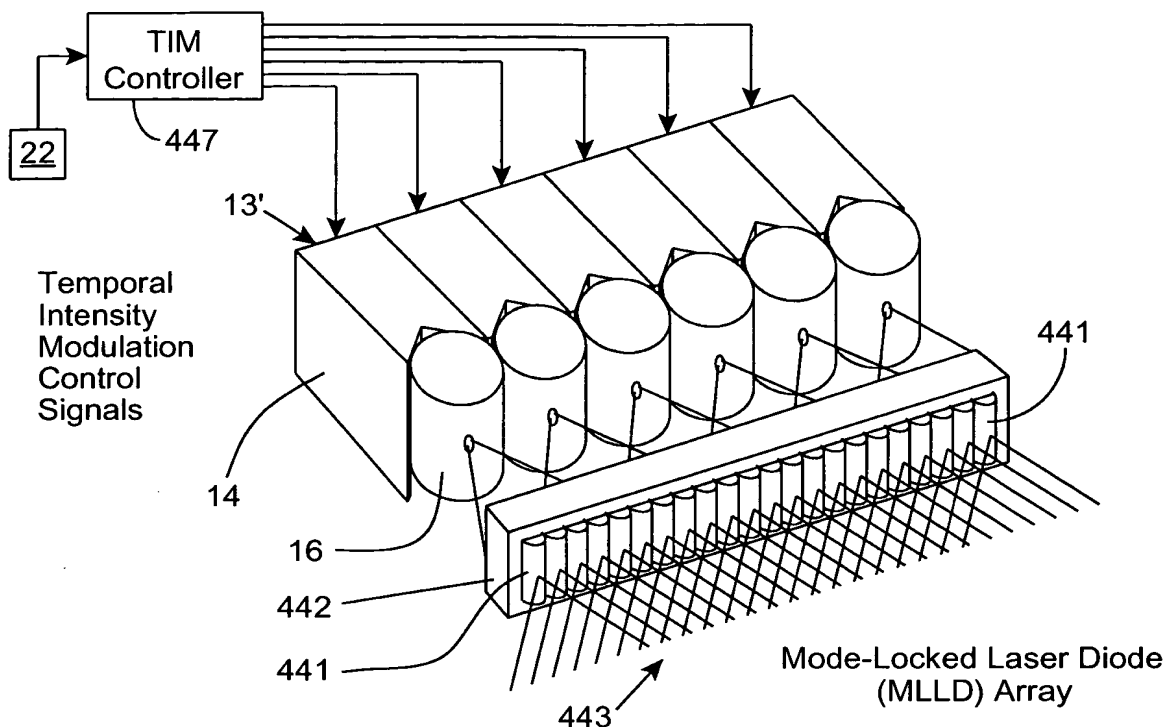


FIG. 1115A

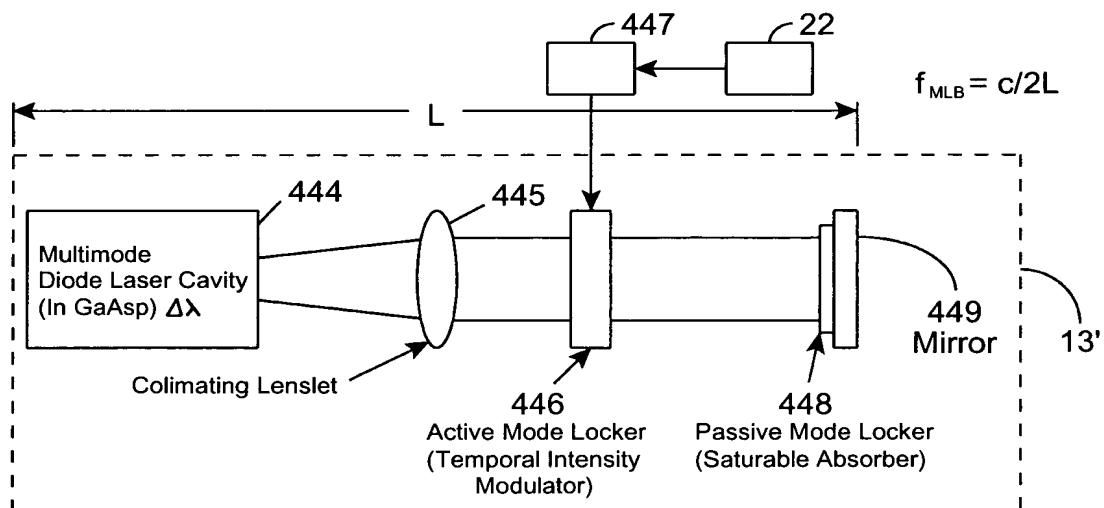


FIG. 1115B

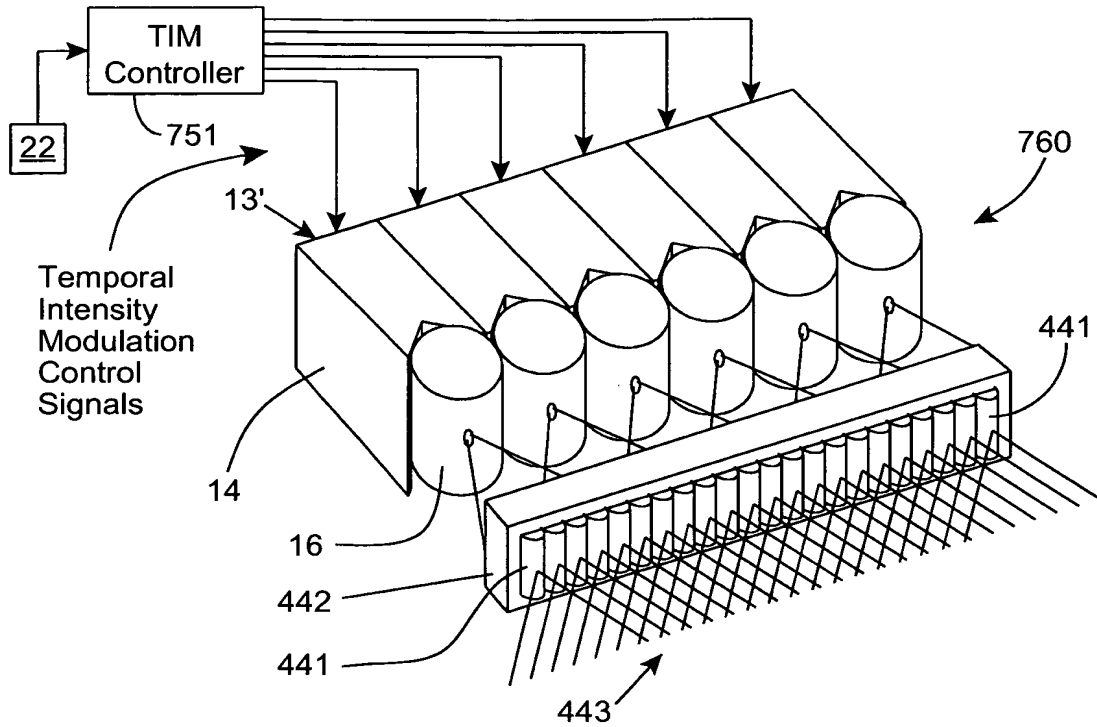


FIG. 1115C

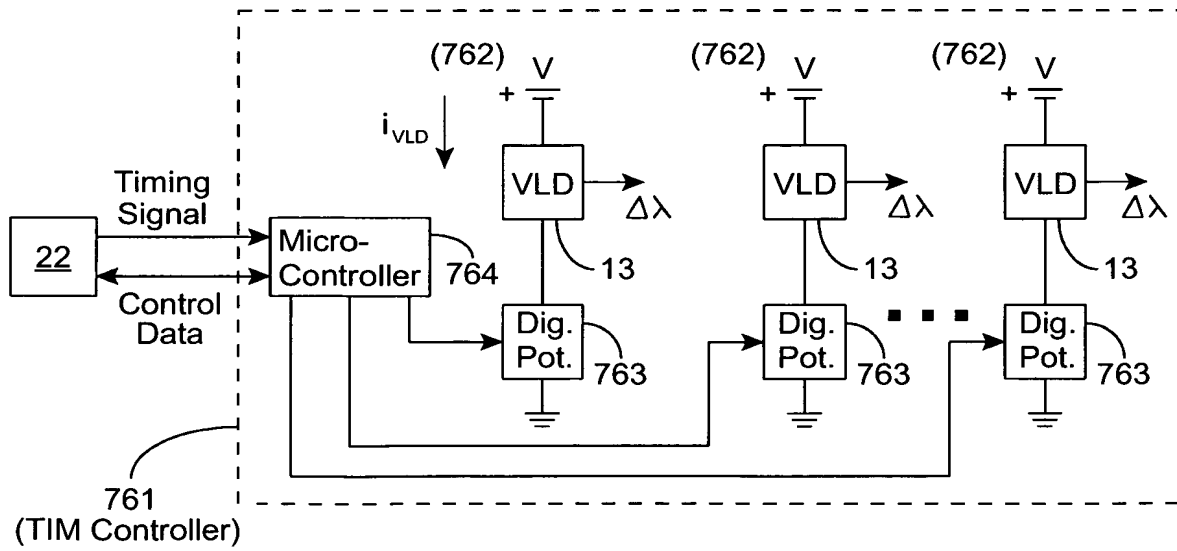


FIG. 1115D

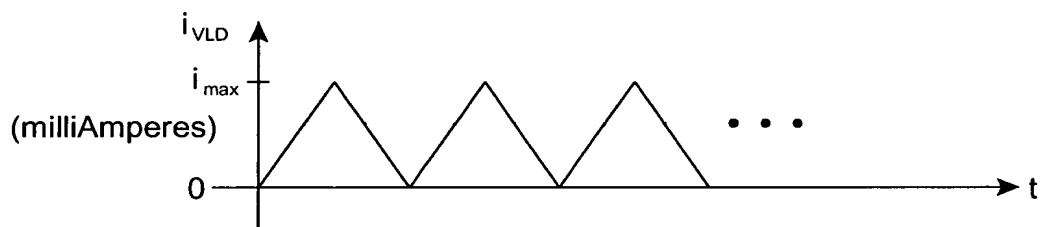


FIG. 1115E

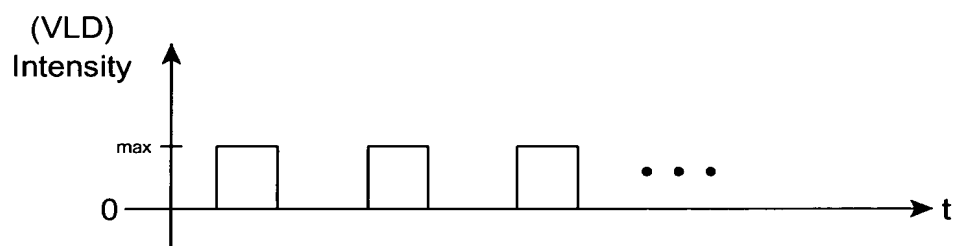


FIG. 1115F



Third Generalized Method Of Reducing Speckle-Noise Patterns At Image Detection Array Of The IFD Subsystem (3)

(TIME)

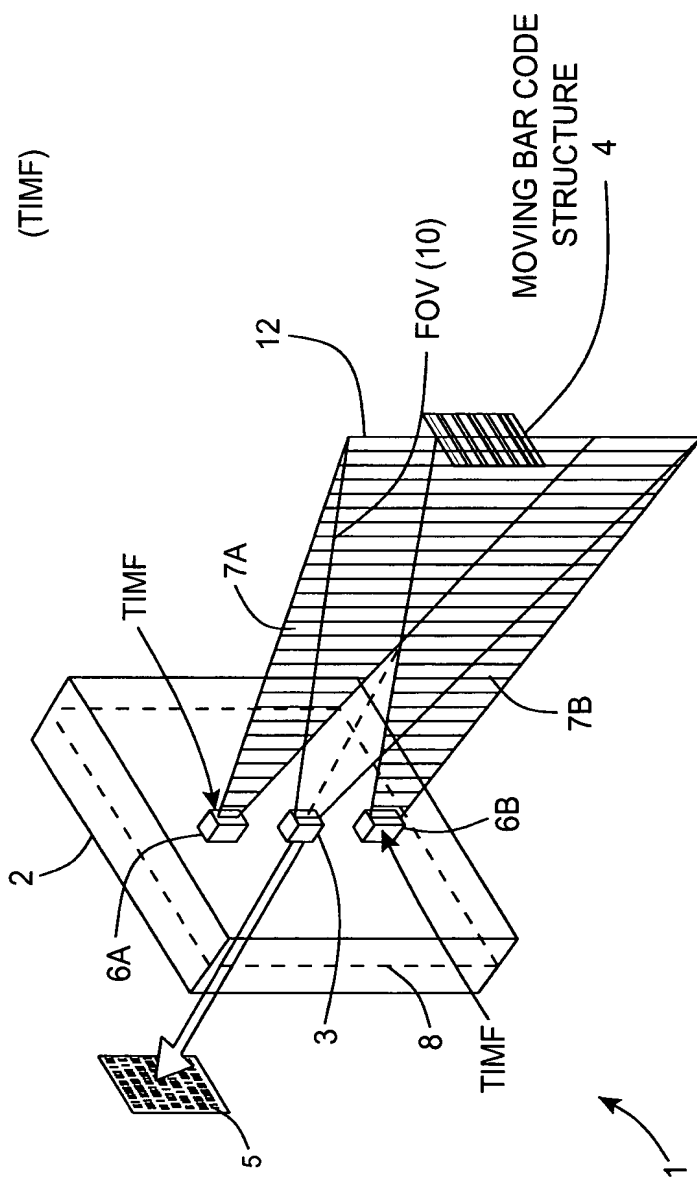


FIG. 1116

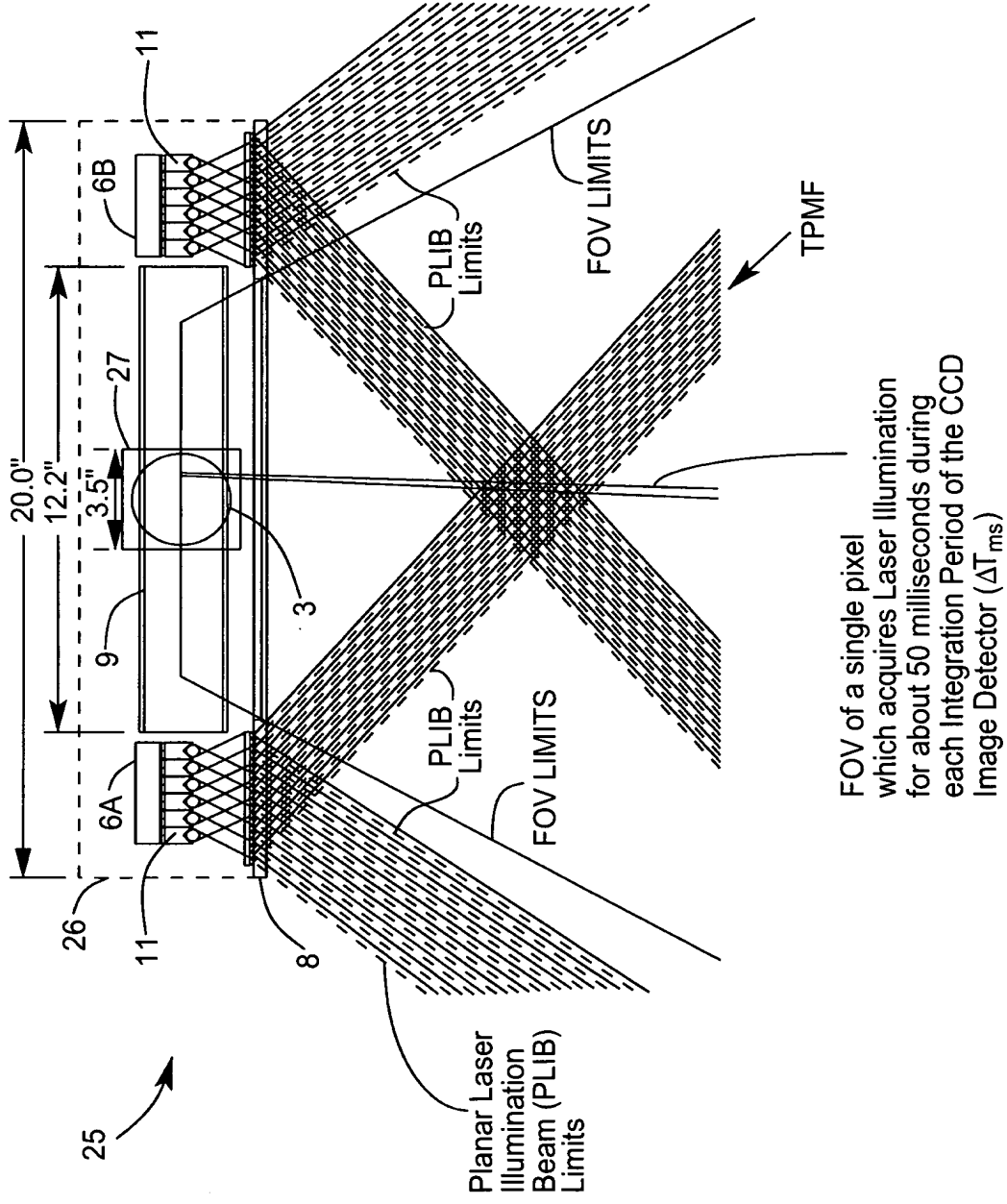


FIG. 1116A



THE THIRD GENERALIZED SPECKLE-NOISE PATTERN REDUCTION
METHOD OF THE PRESENT INVENTION

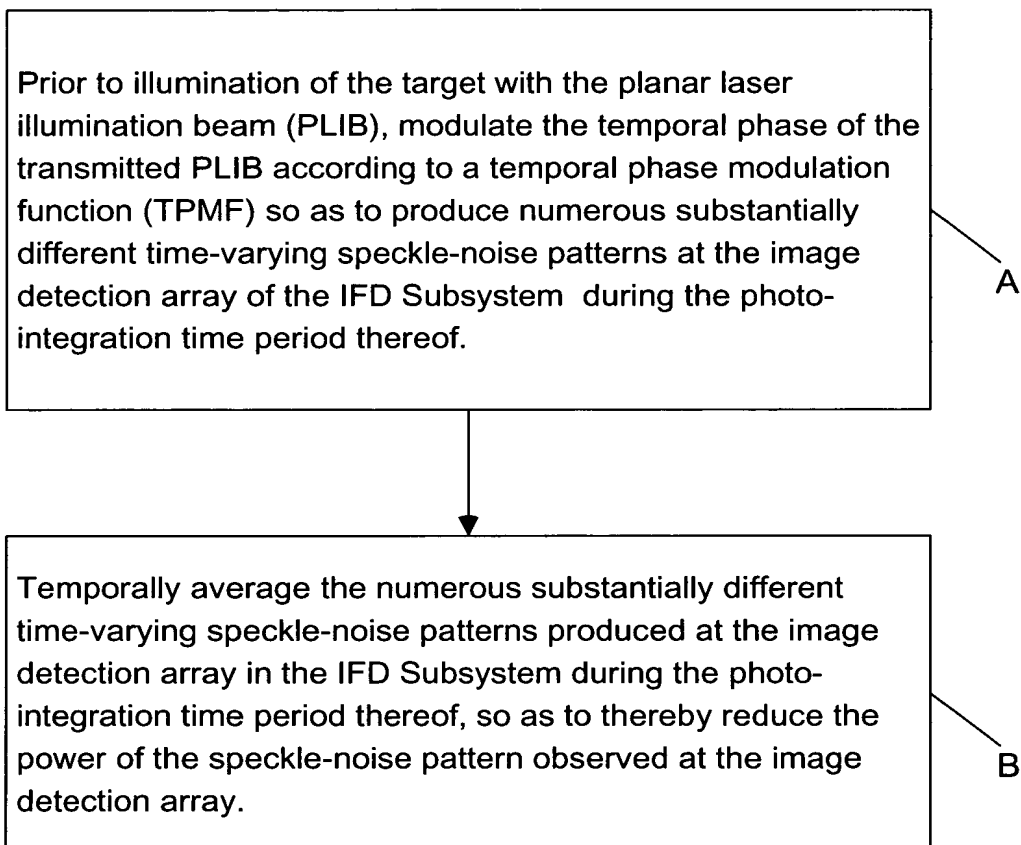


FIG. 1116B

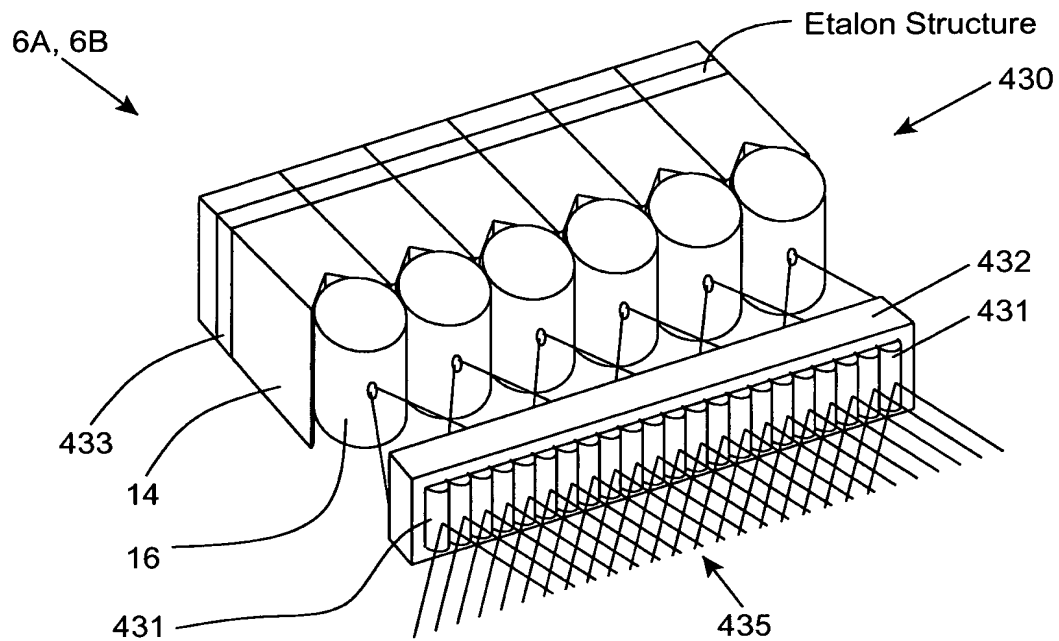


FIG. 1117A

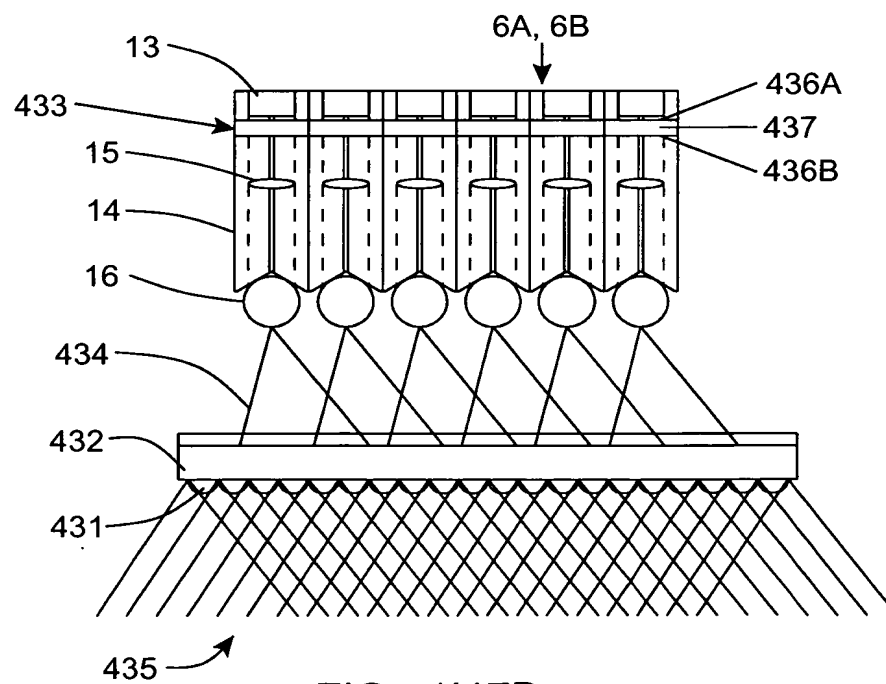


FIG. 1117B

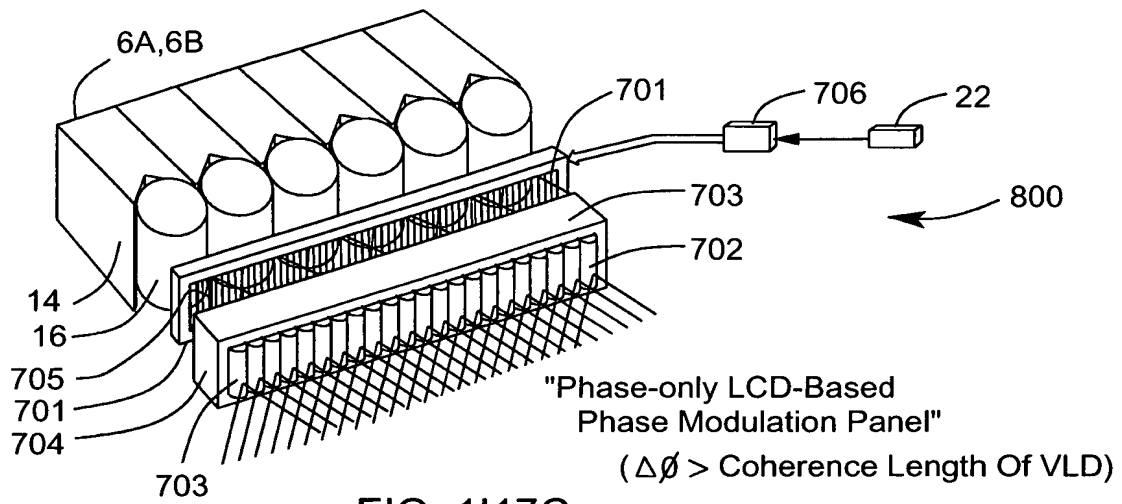


FIG. 1117C

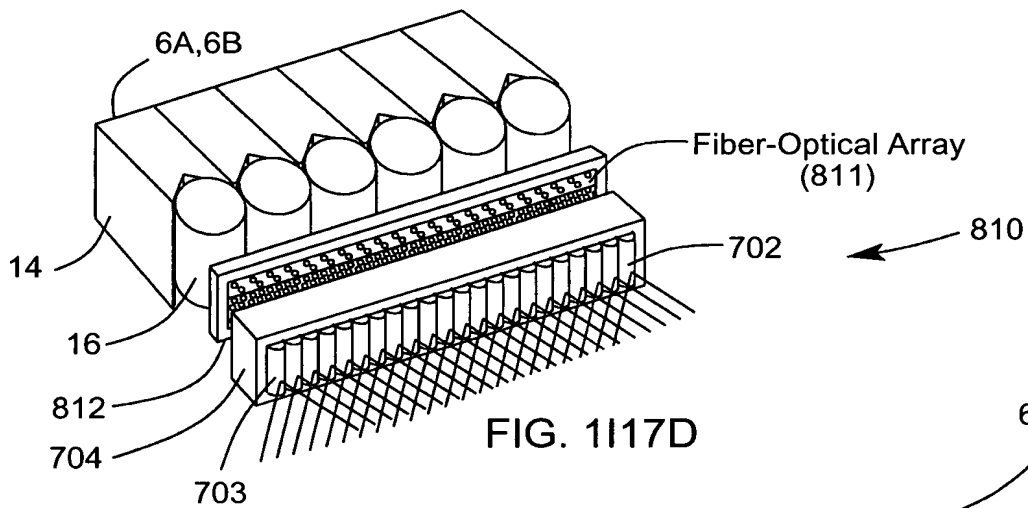


FIG. 1117D

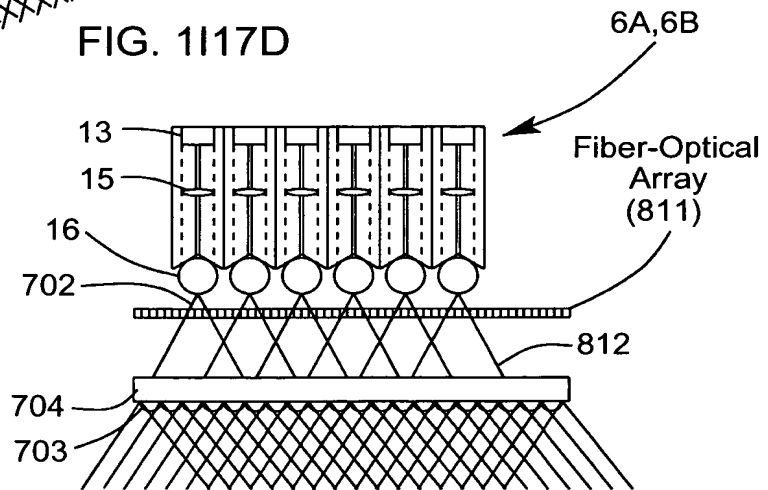


FIG. 1117E

Fourth Generalized Method Of
Reducing Speckle-Noise Patterns
At Image Detection Array
Of The IFD Subsystem (3)

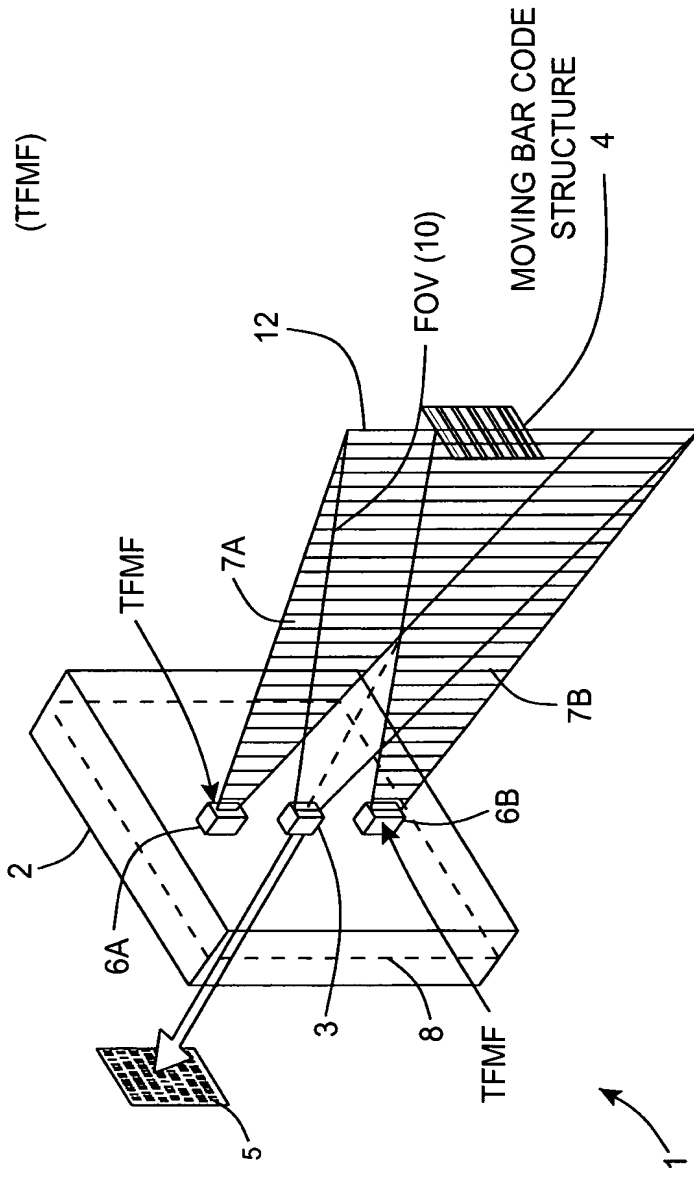


FIG. 1118

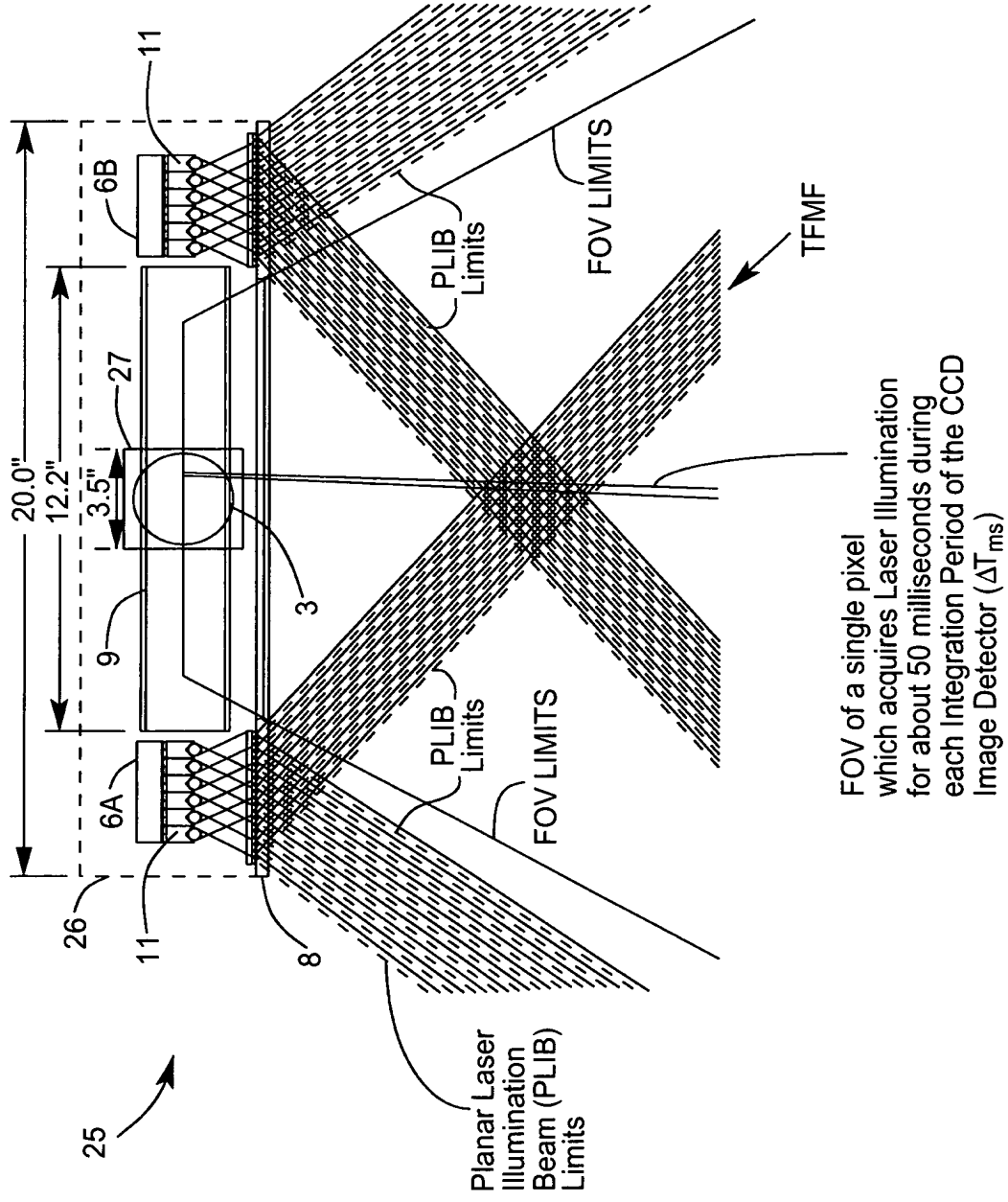


FIG. 1118A



THE FOURTH GENERALIZED SPECKLE-NOISE PATTERN REDUCTION
METHOD OF THE PRESENT INVENTION

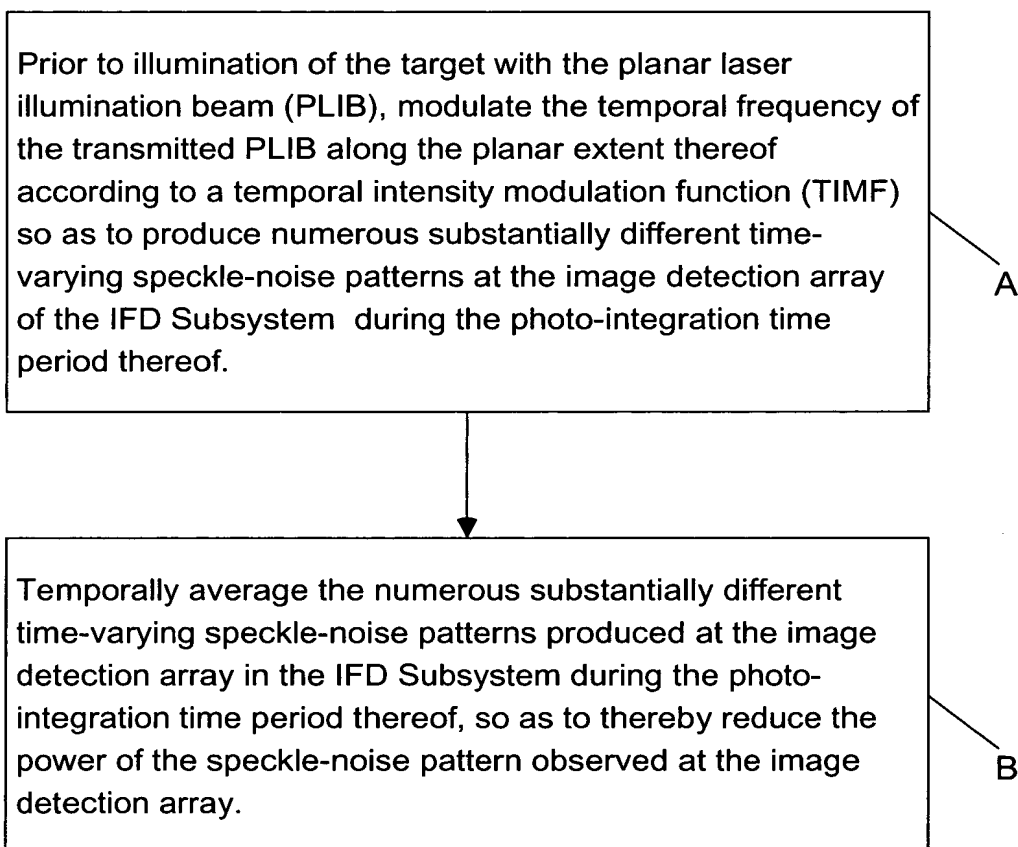


FIG. 1118B

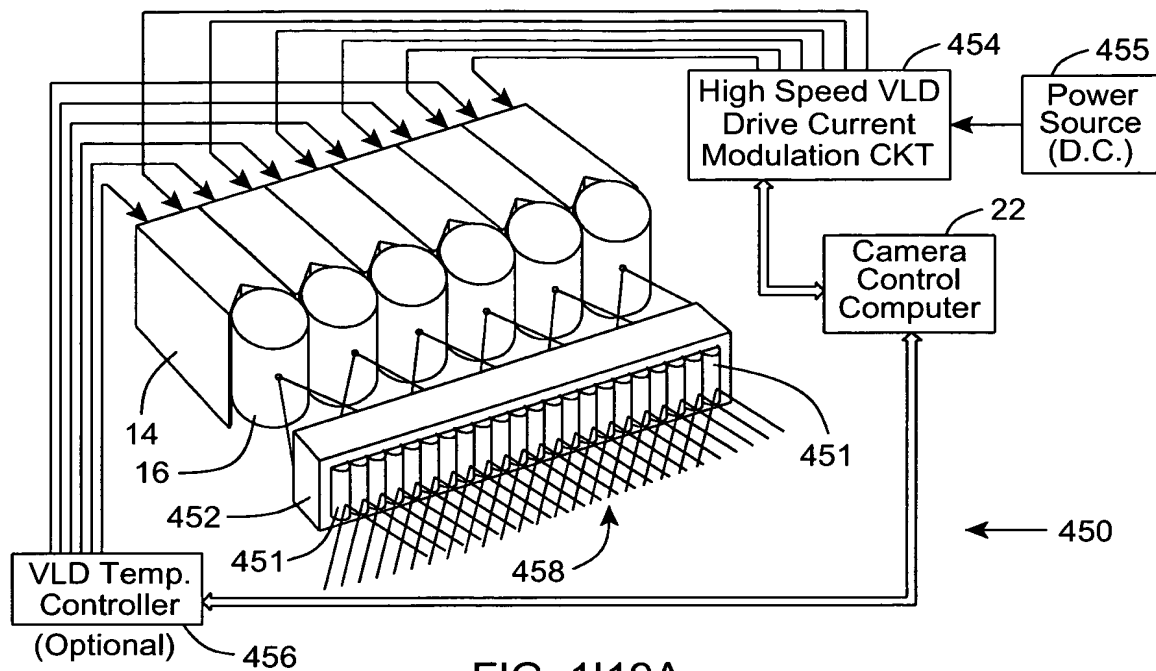


FIG. 1119A

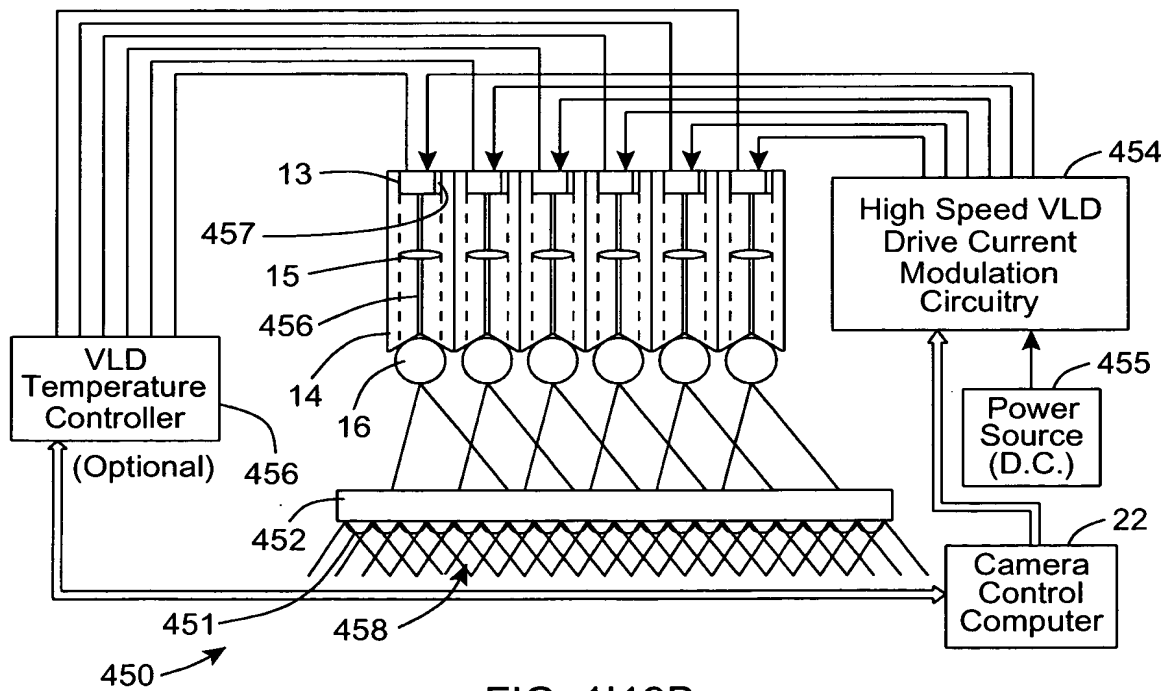


FIG. 1119B

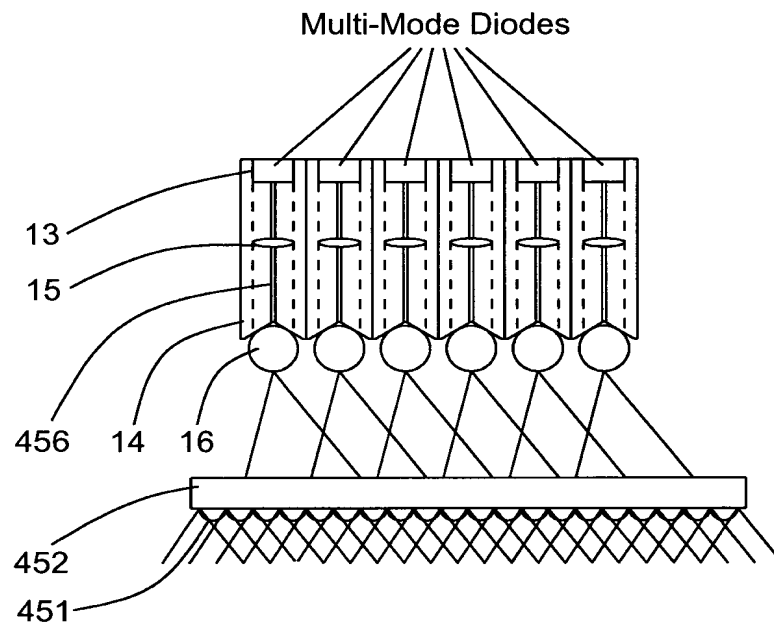


FIG. 1119C

Fifth Generalized Method Of
 Reducing Speckle-Noise Patterns
 At Image Detection Array
 Of The IFD Subsystem (3)

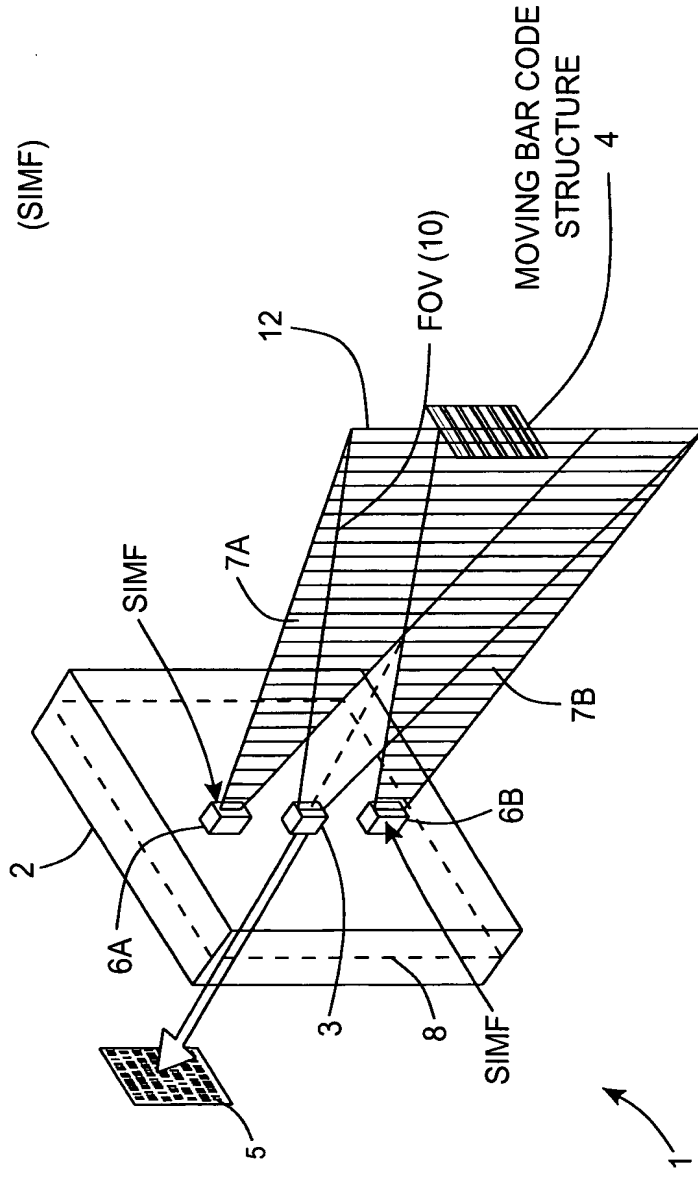


FIG. 1120

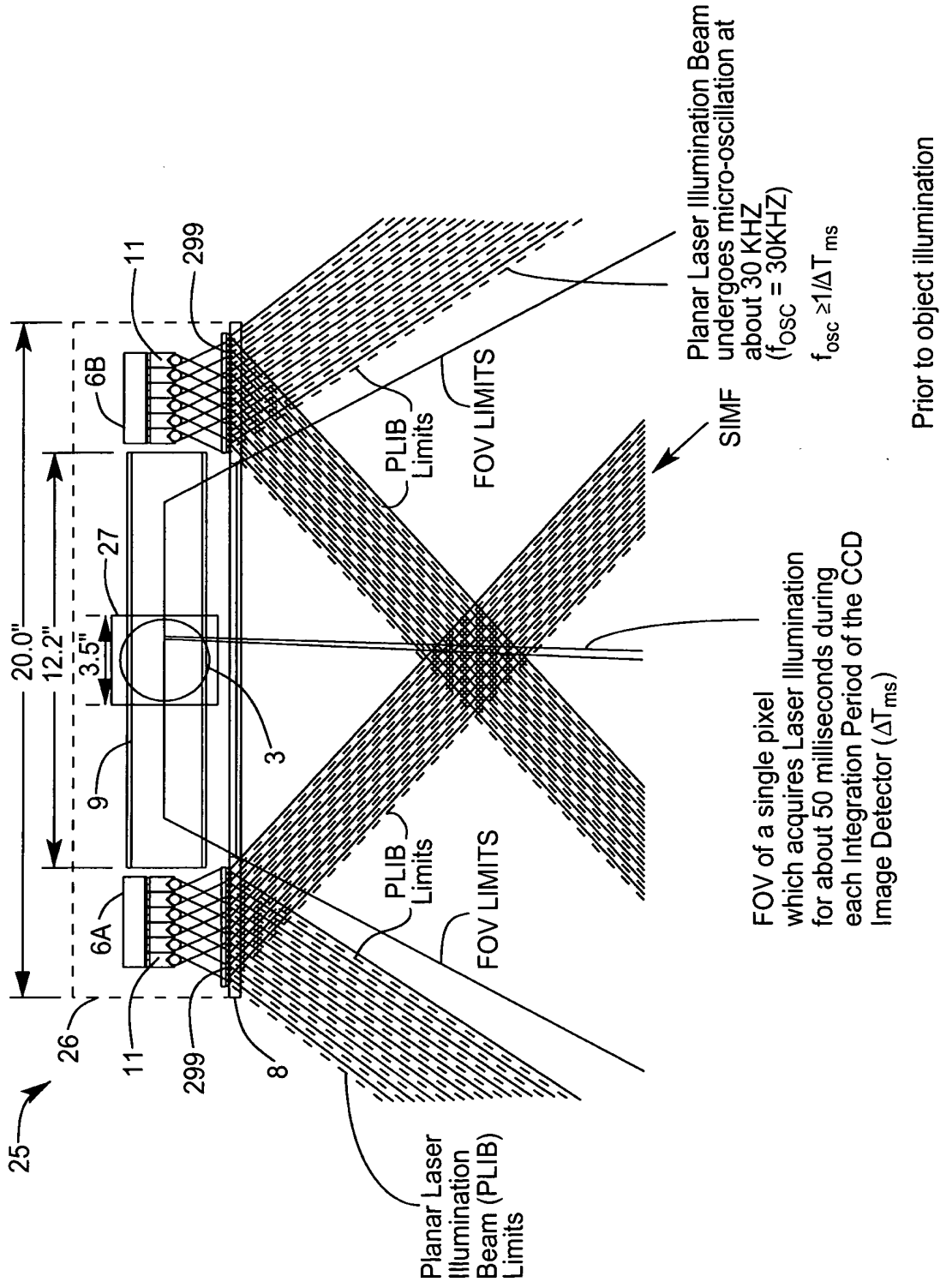


FIG. 1120A



THE FIFTH GENERALIZED SPECKLE-NOISE PATTERN REDUCTION
METHOD OF THE PRESENT INVENTION

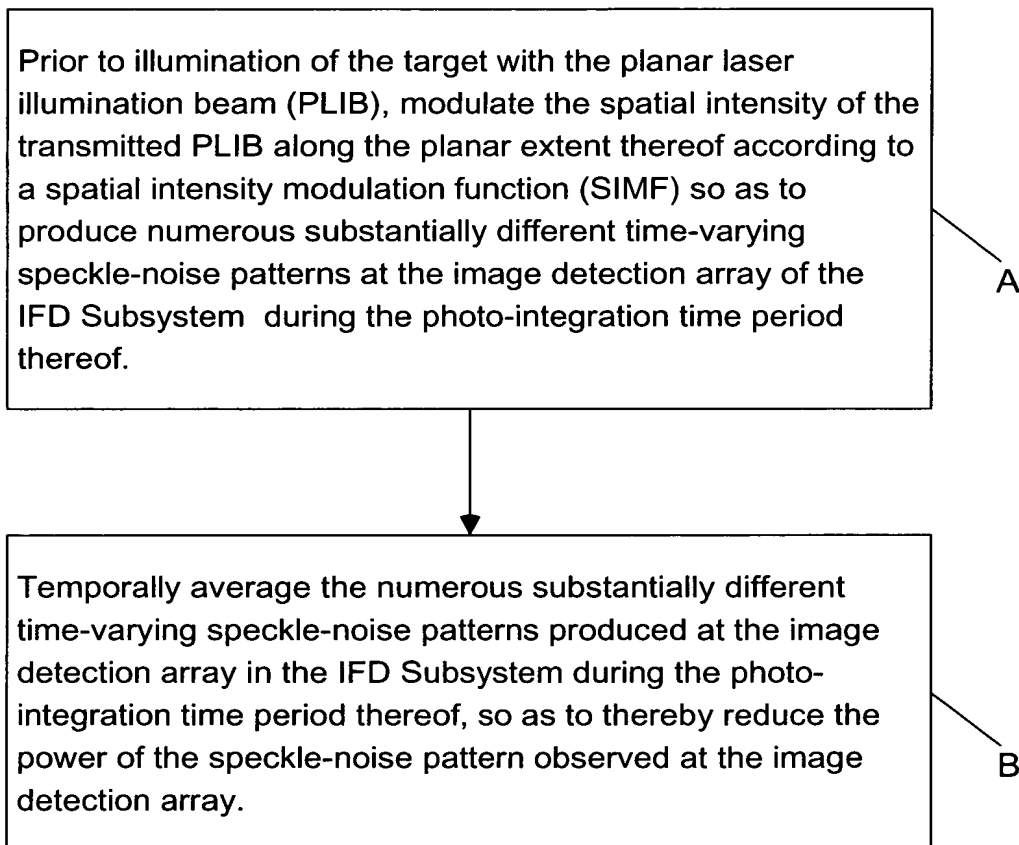
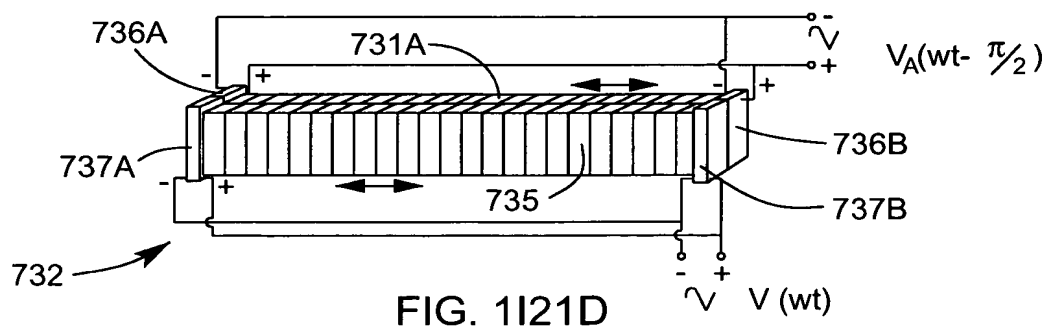
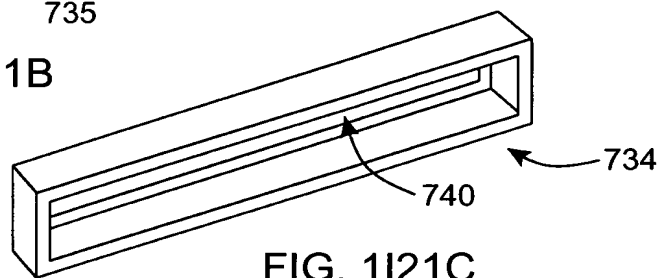
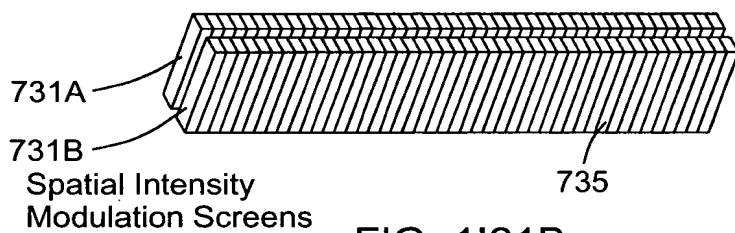
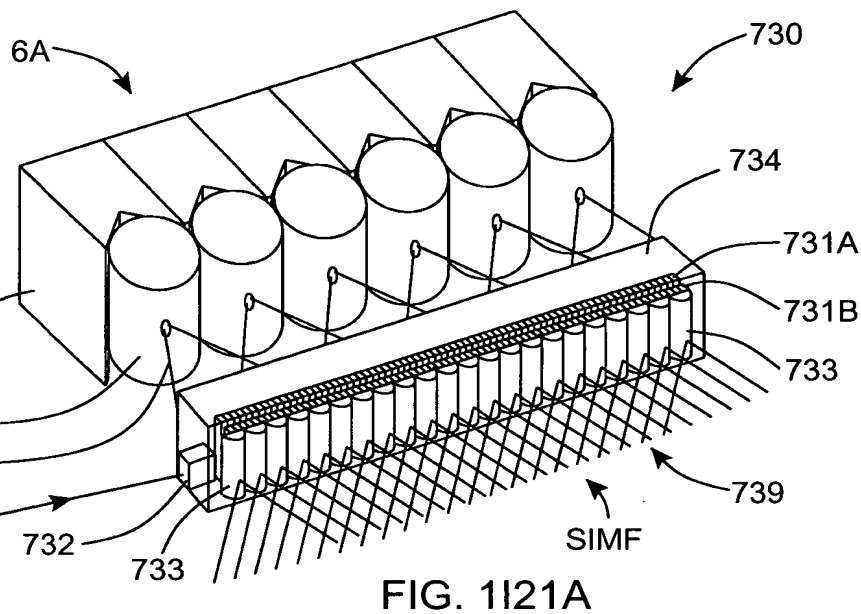


FIG. 1120B



Sixth Generalized Method Of
Reducing Speckle-Noise Patterns
At Image Detection Array
Of The IFD Subsystem (3)

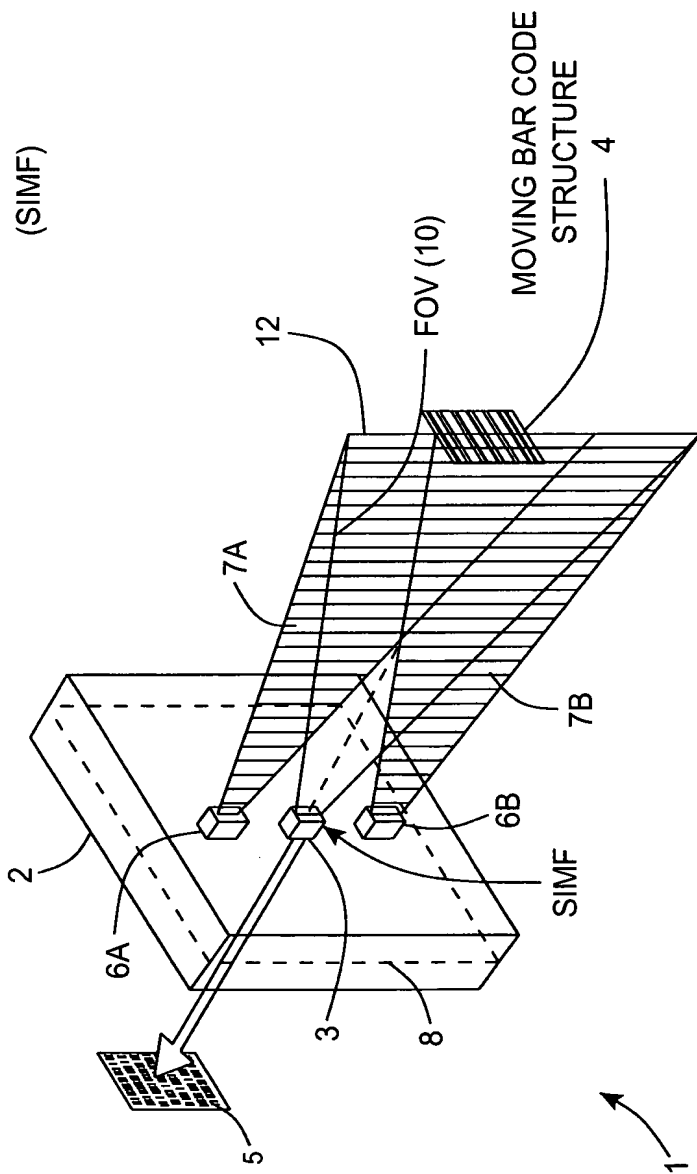


FIG. 1122

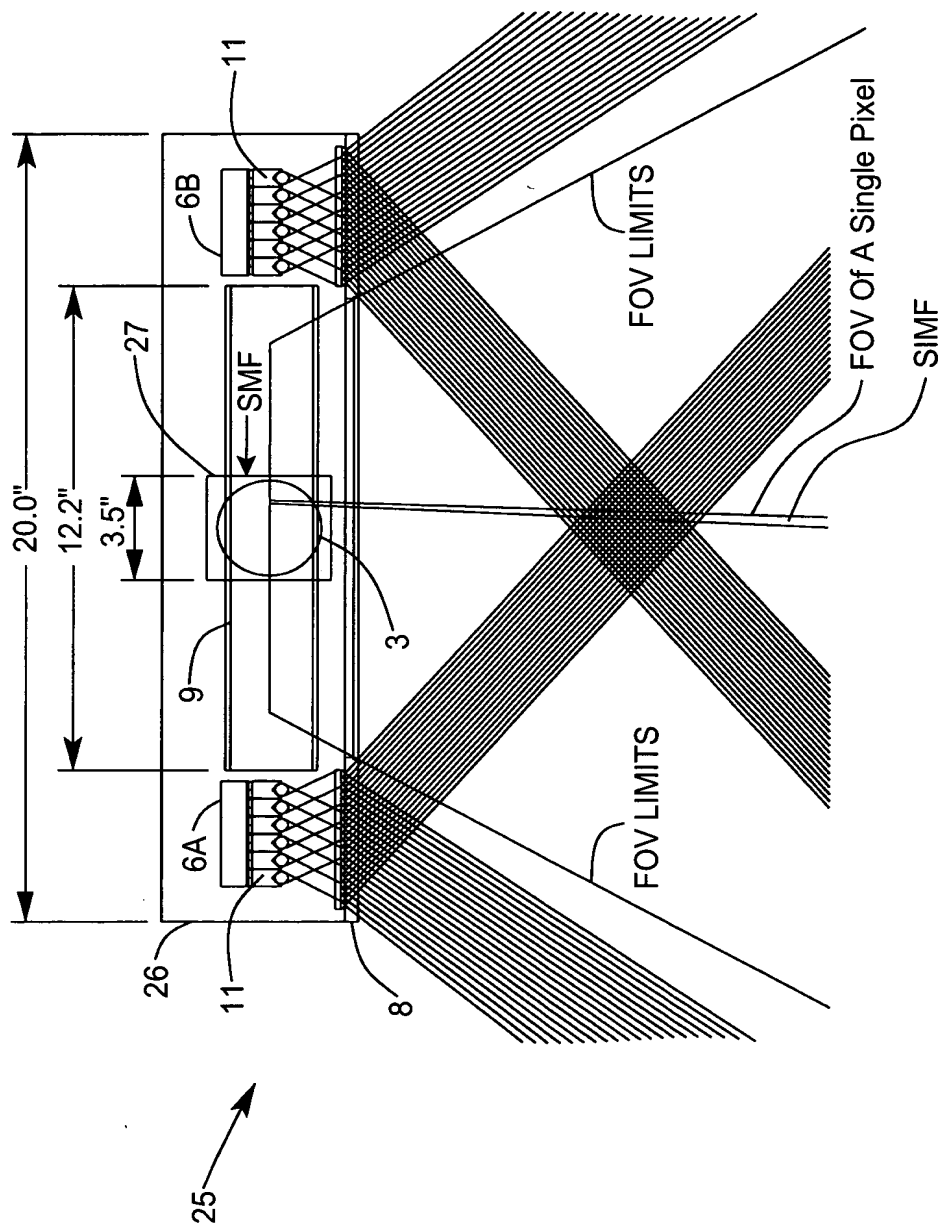


FIG. 1122A



THE SIXTH GENERALIZED SPECKLE-NOISE PATTERN REDUCTION
METHOD OF THE PRESENT INVENTION

After illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

A

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

B

FIG. 1I22B

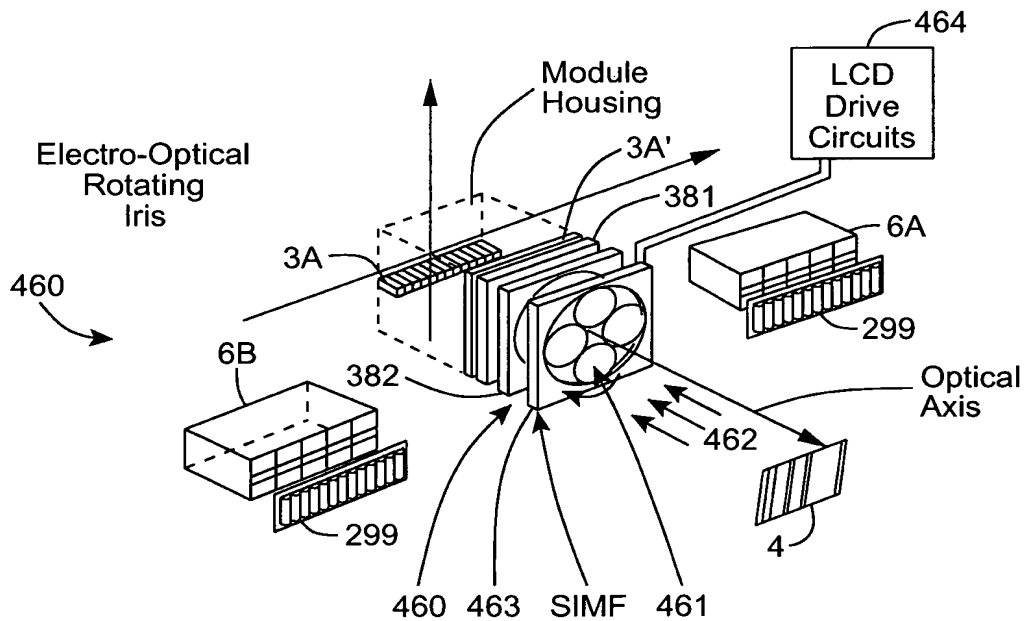


FIG. 1123A

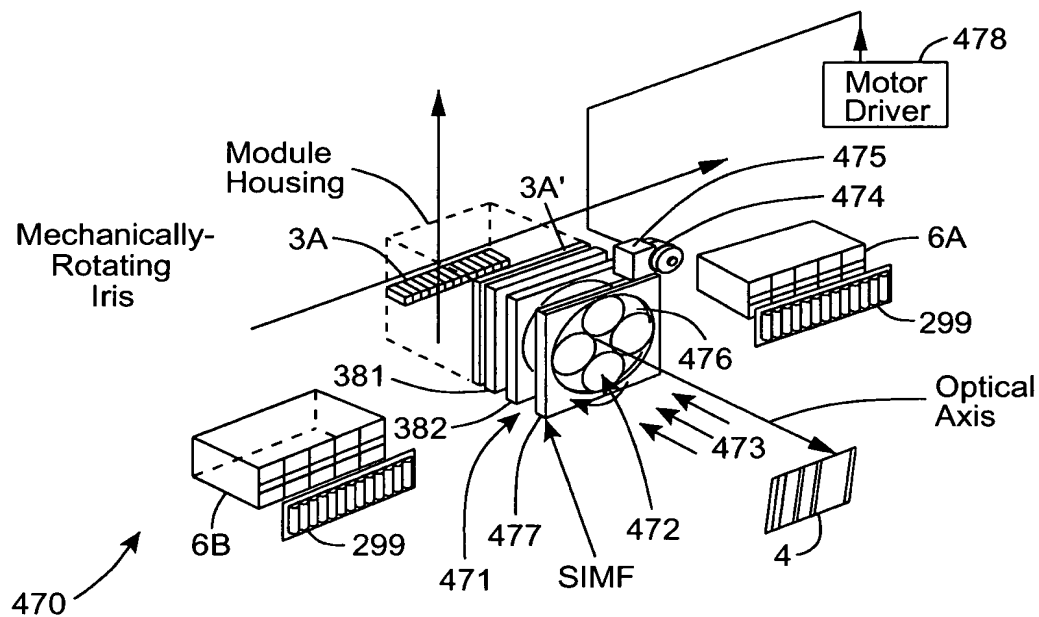


FIG. 1123B

Seventh Generalized Method Of
Reducing Speckle-Noise Patterns
At Image Detection Array
Of The IFD Subsystem (3)

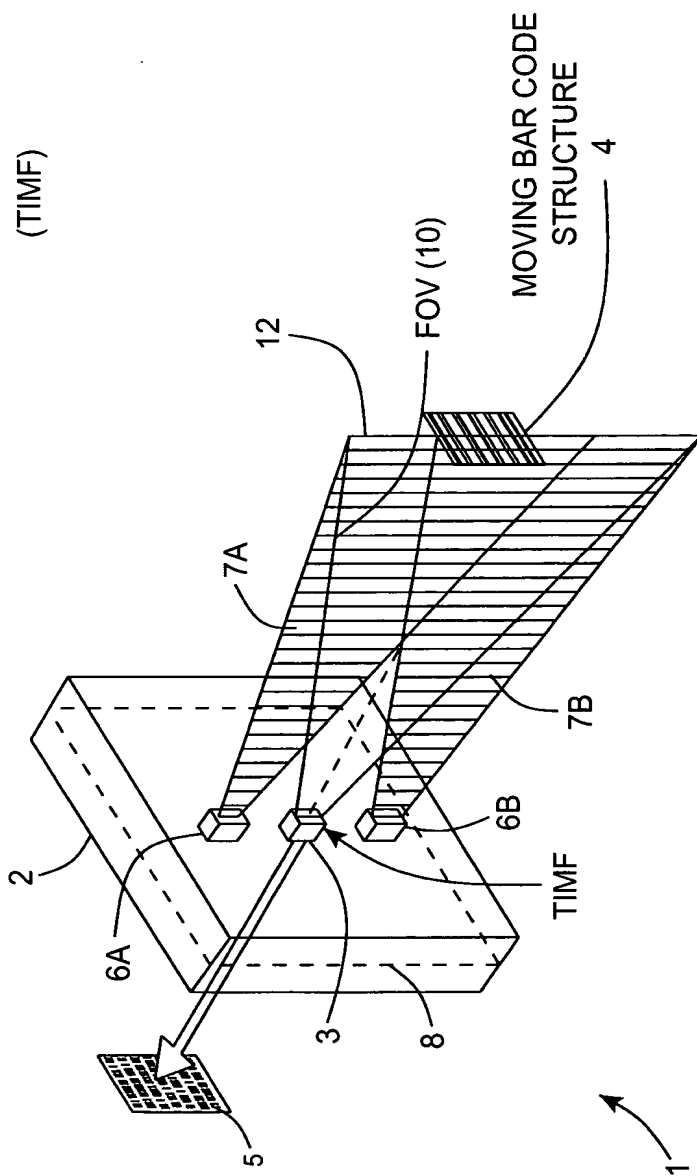


FIG. 1124

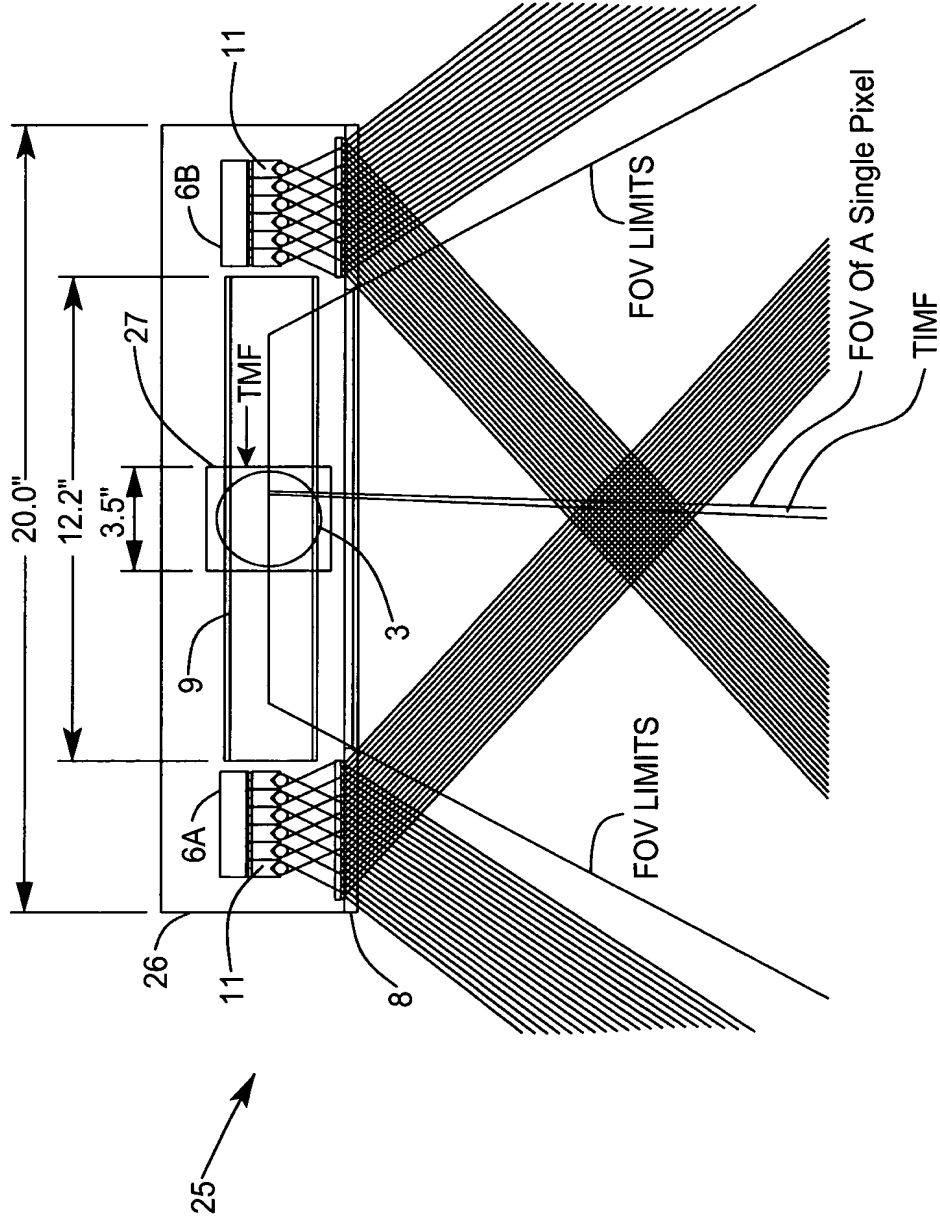


FIG. 1124A



THE SEVENTH GENERALIZED SPECKLE-NOISE PATTERN REDUCTION
METHOD OF THE PRESENT INVENTION

After illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to produce many substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

A



Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

B

FIG. 1124B

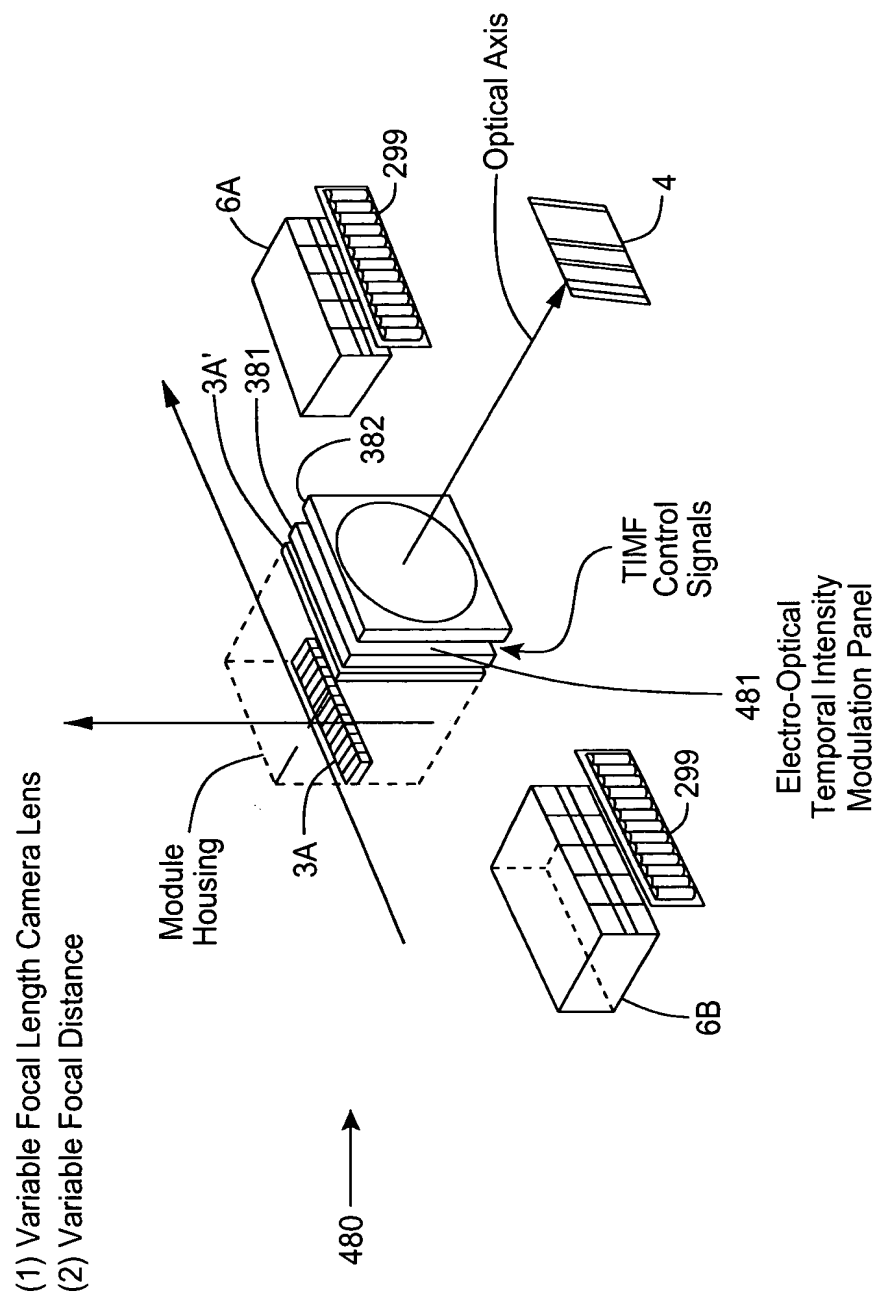


FIG. 1124C



THE EIGHT GENERALIZED SPECKLE-NOISE PATTERN REDUCTION
METHOD OF THE PRESENT INVENTION

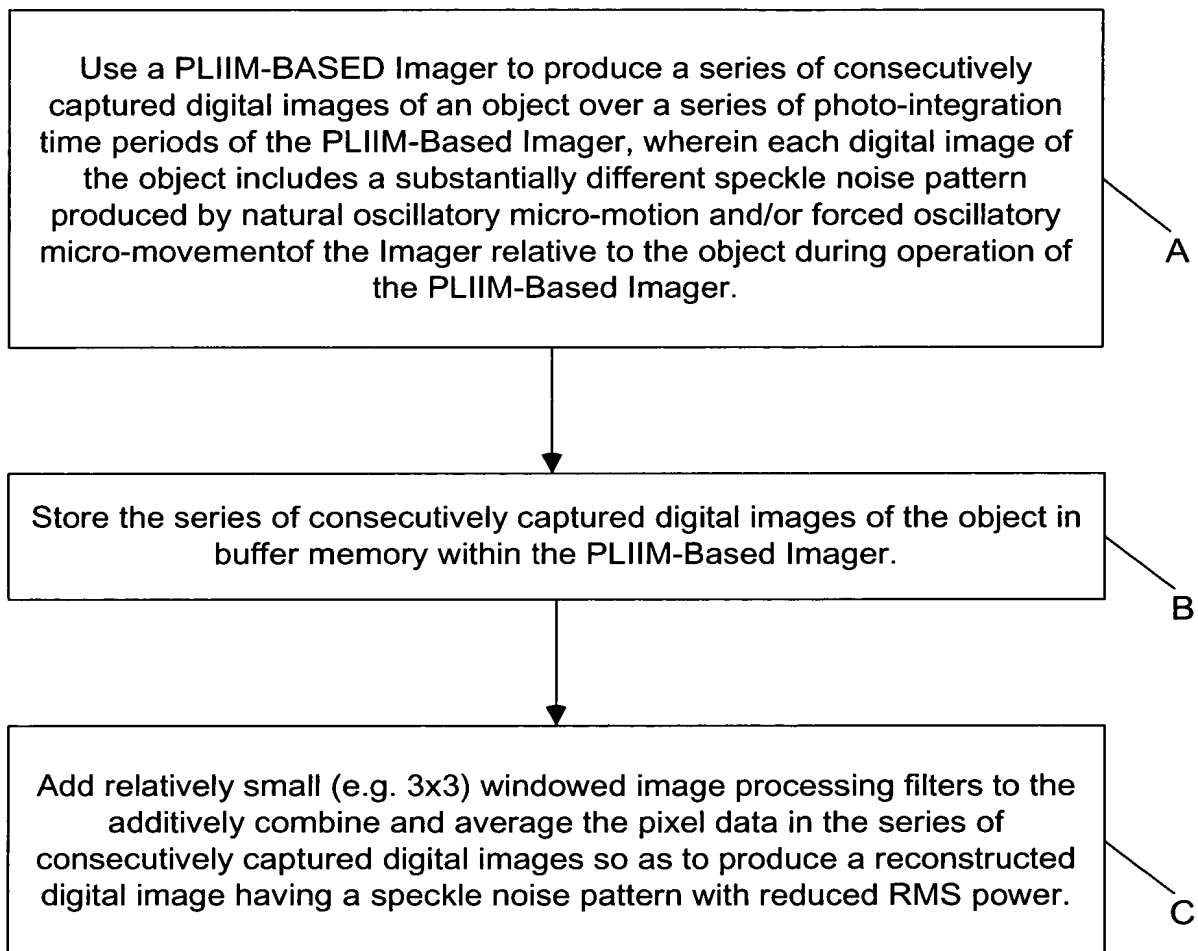
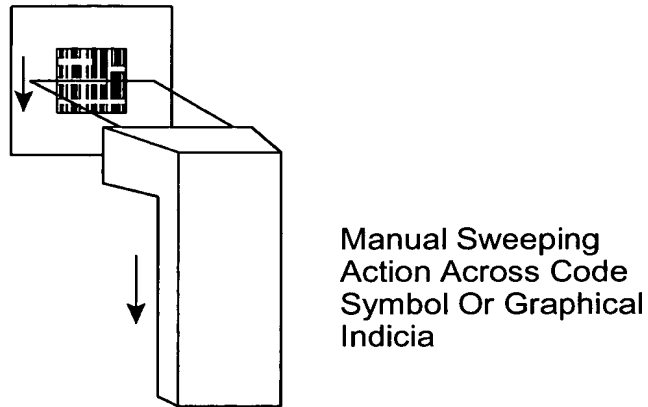
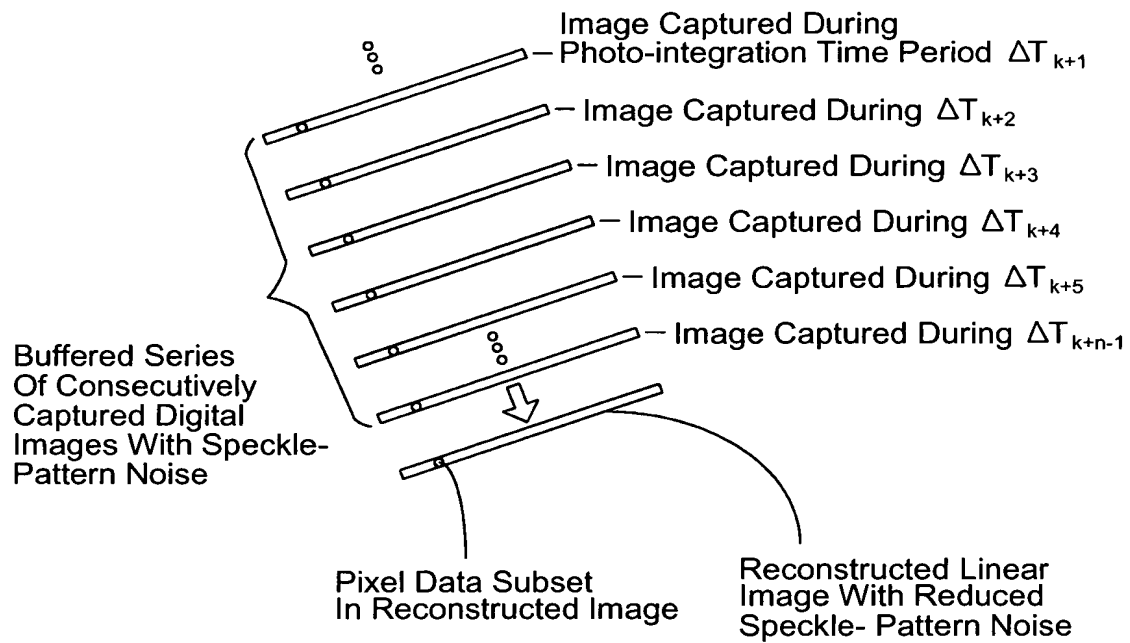


FIG. 1I24D



Manual Sweeping
Action Across Code
Symbol Or Graphical
Indicia

FIG. 1I24E



Case: Linear Imager

FIG. 1I24F

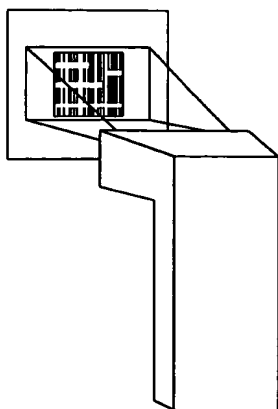
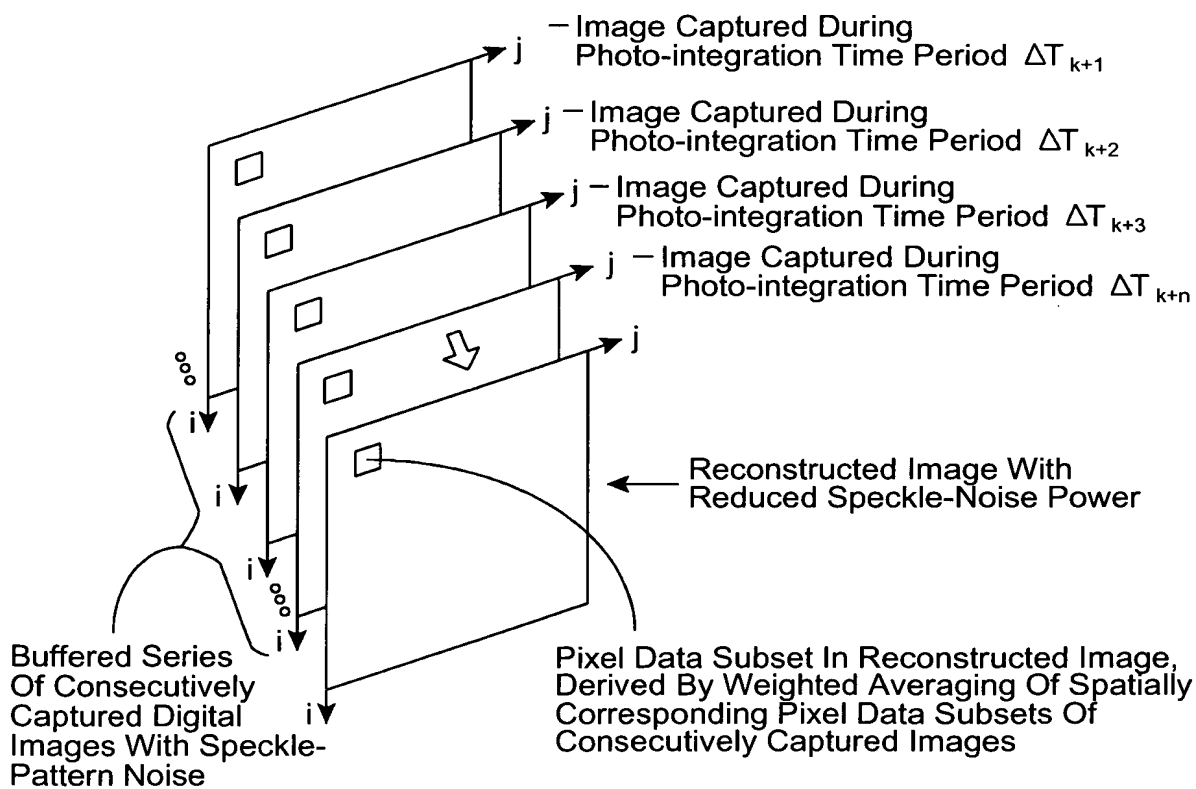


FIG. 1I24G



Case: 2D Area Imager

FIG. 1I24H



THE NINTH GENERALIZED METHOD OF REDUCING SPECKLE PATTERN
NOISE IN PLIIM-BASED IMAGING SYSTEMS

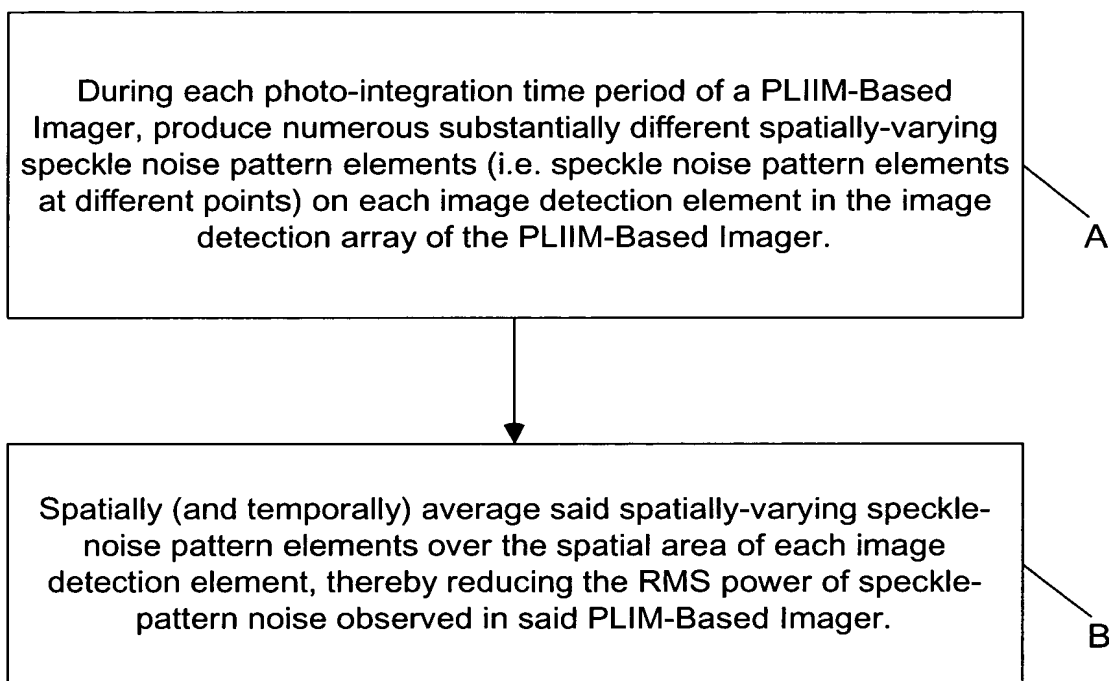
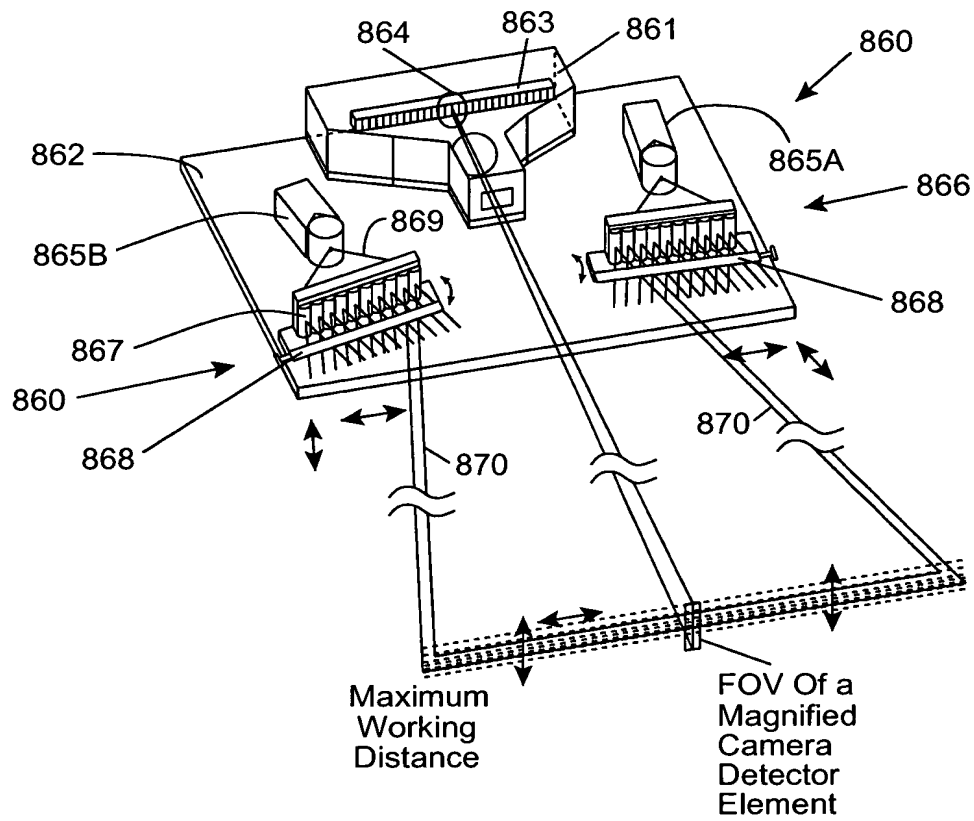


FIG. 1124I



* Lateral And
 Transverse
 Micro-oscillation
 Of PLIB

FIG. 1I25A1

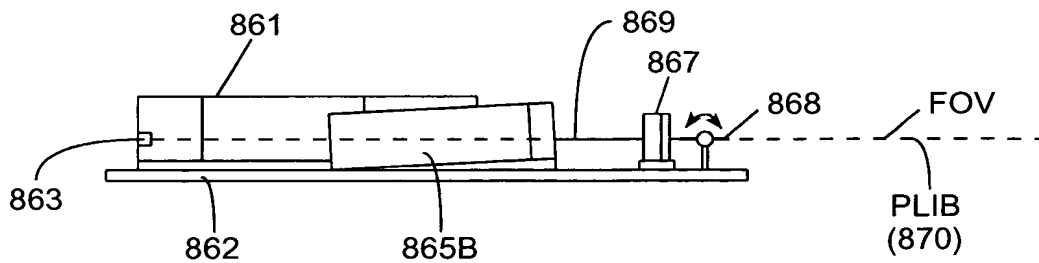


FIG. 1I25A2

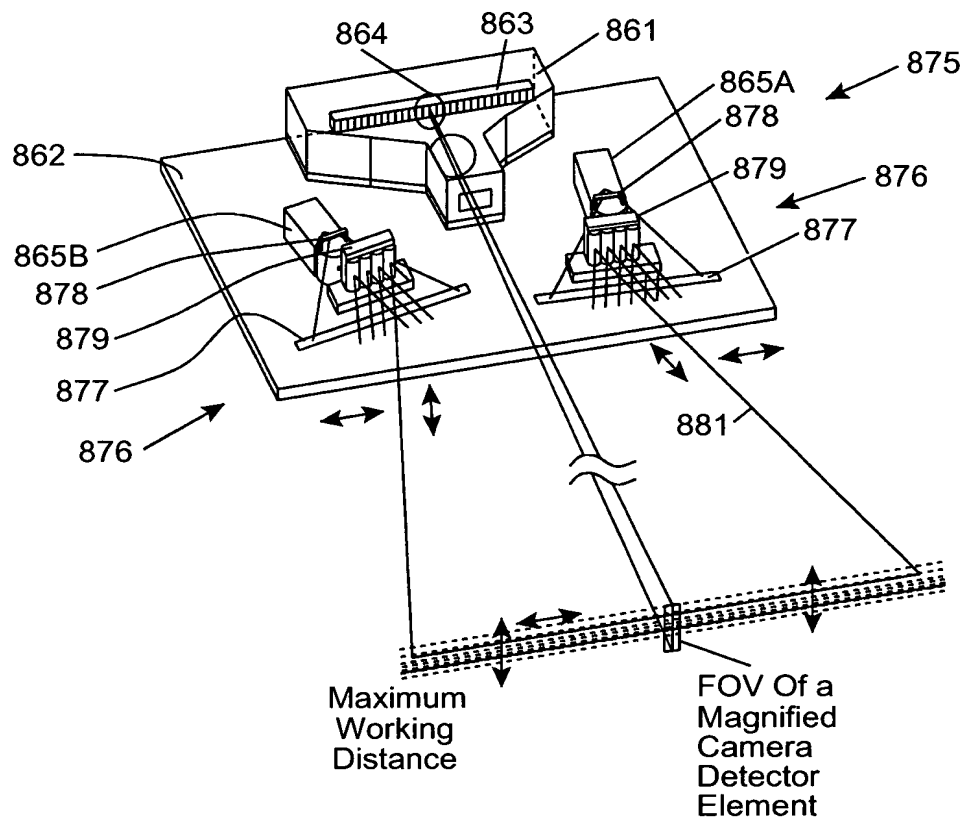


FIG. 1125B1

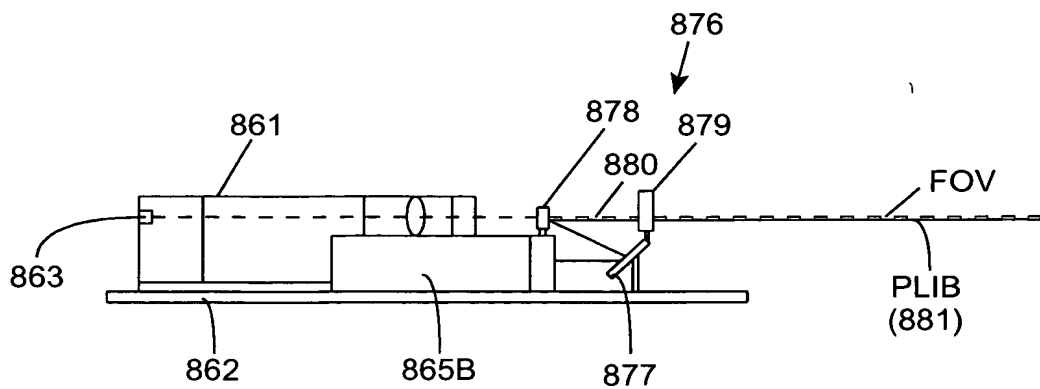


FIG. 1125B2

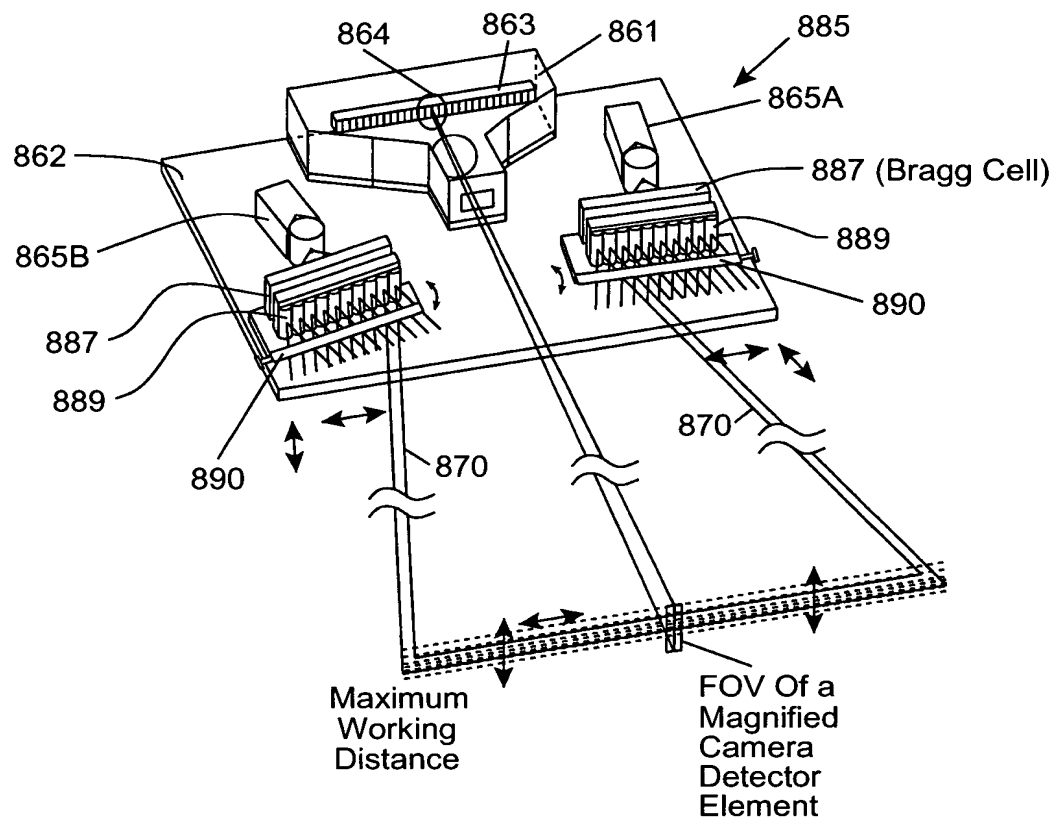


FIG. 1125C1

* Lateral And
 Transverse
 Micro-oscillation
 Of PLIB

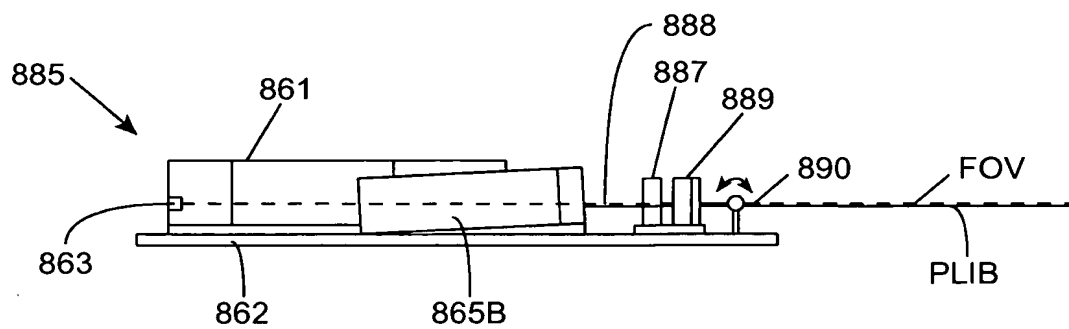
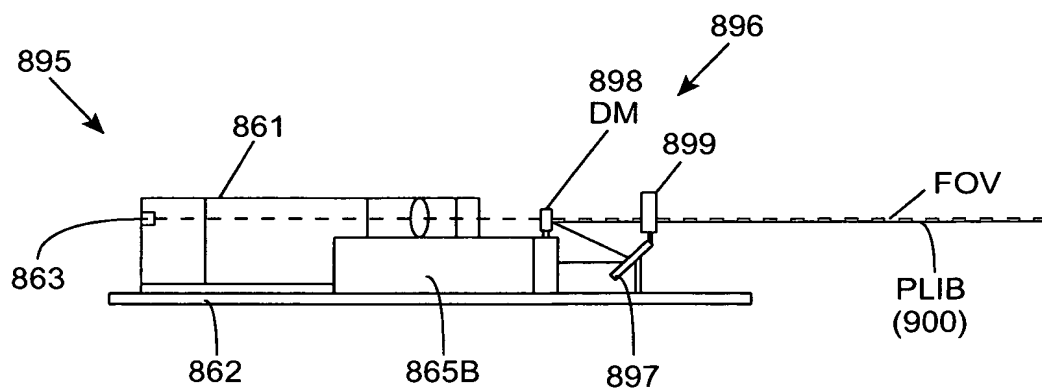
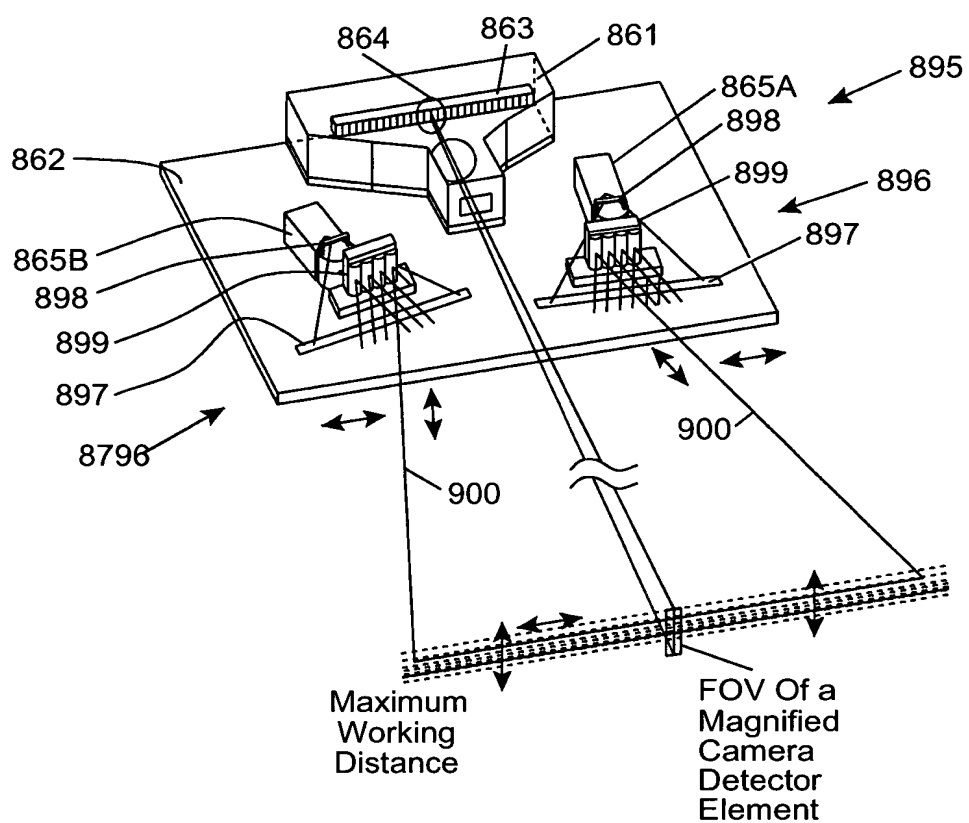


FIG. 1125C2



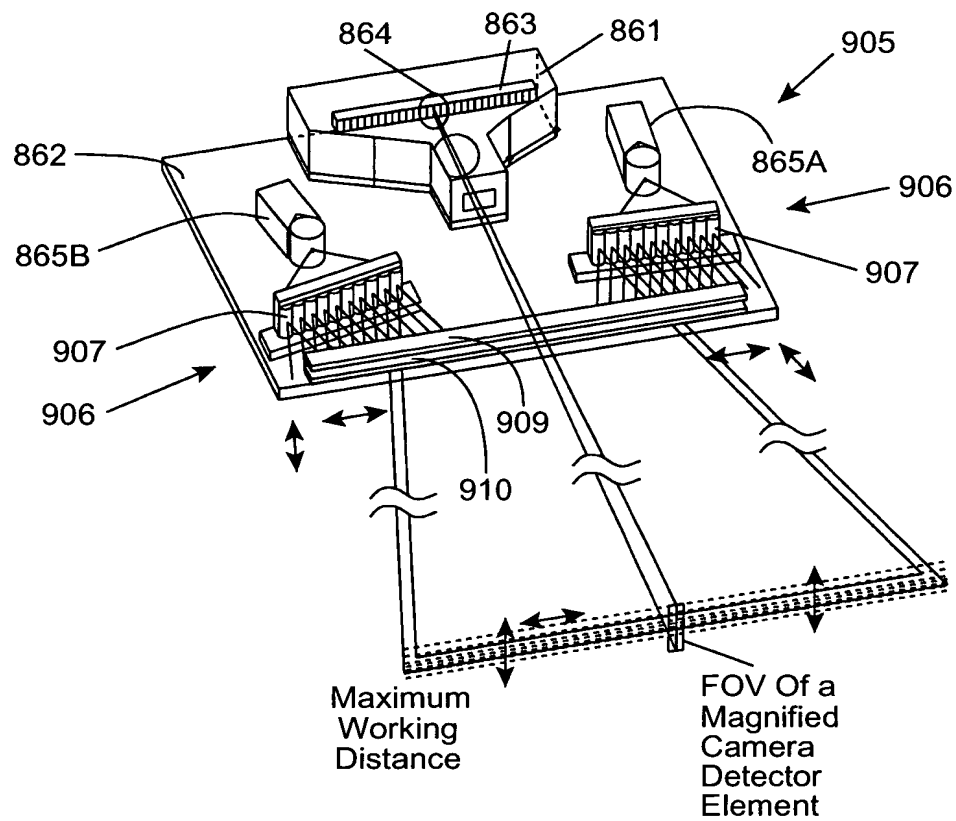


FIG. 1I25E1

* Lateral And Transverse Micro-oscillation Of PLIB

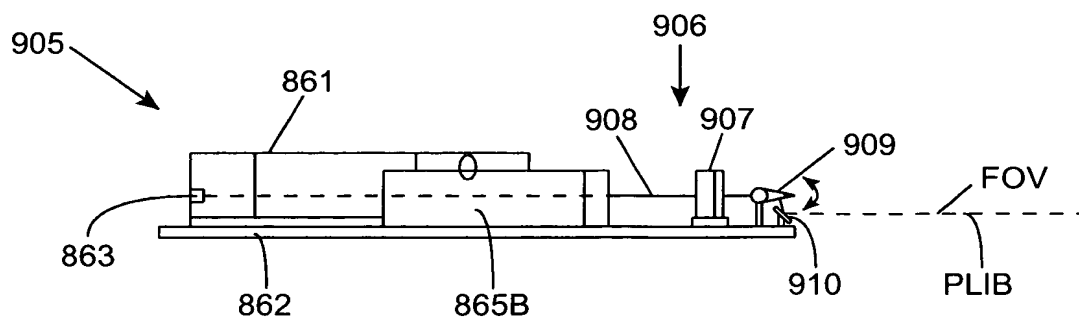


FIG. 1I25E2

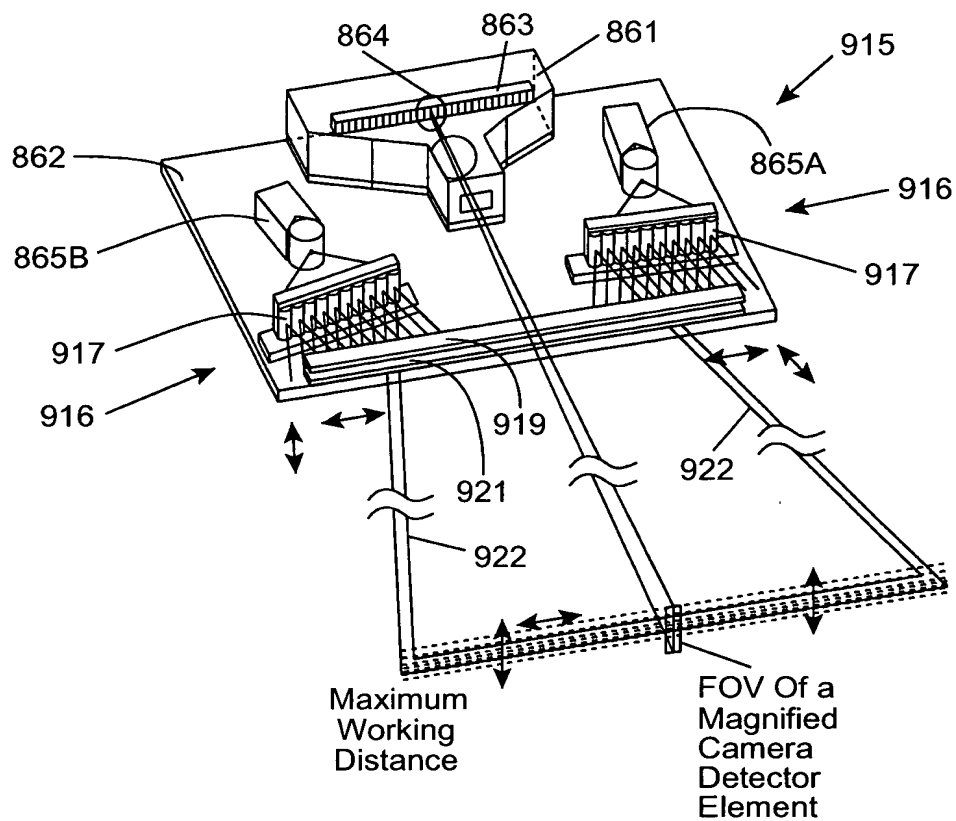


FIG. 1I25F1

* Lateral And Transverse Micro-oscillation Of PLIB

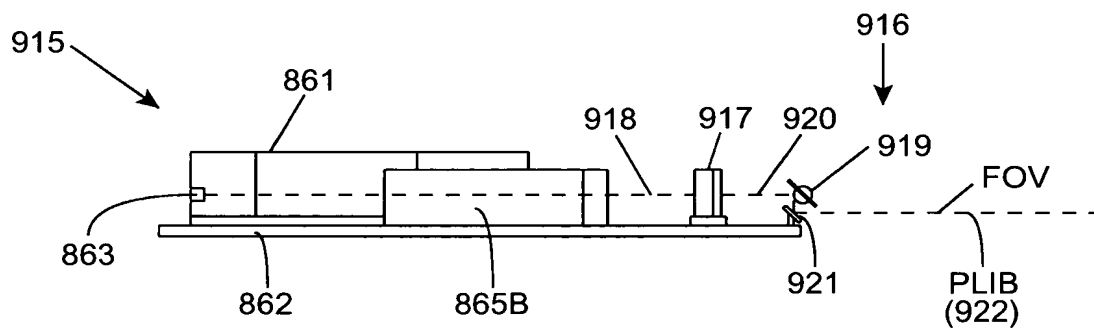
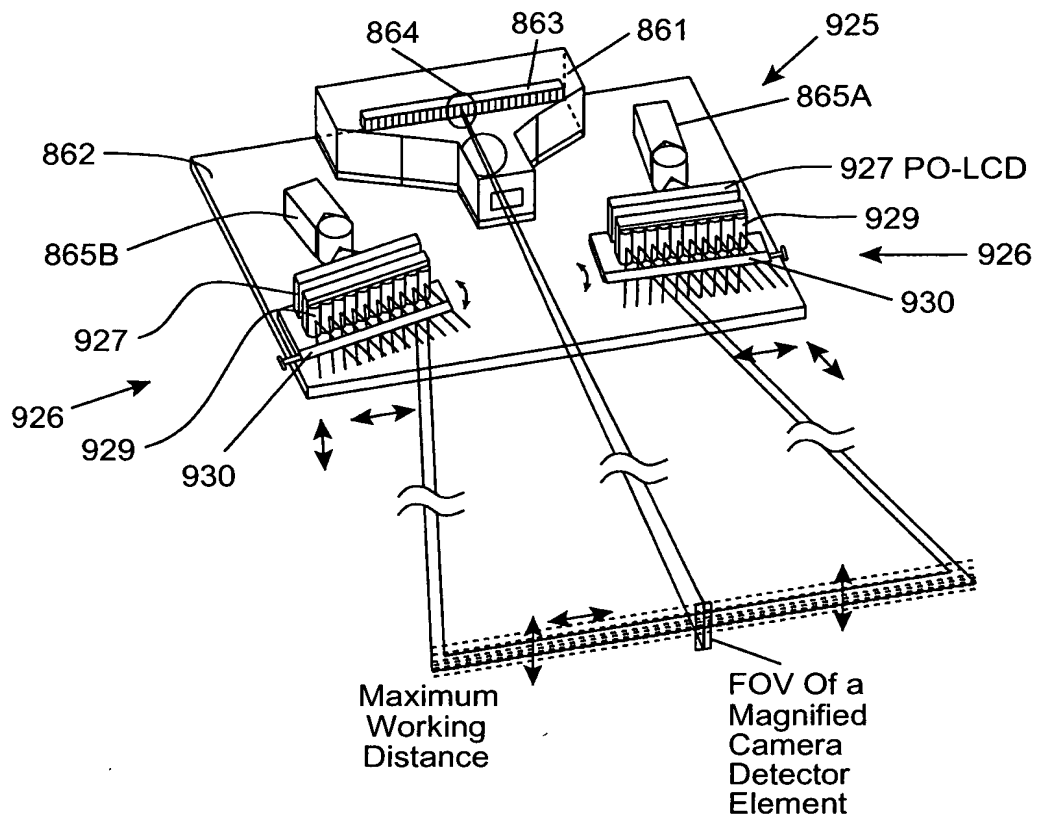


FIG. 1I25F2



* Lateral And Transverse Micro-oscillation Of PLIB

FIG. 1I25G1

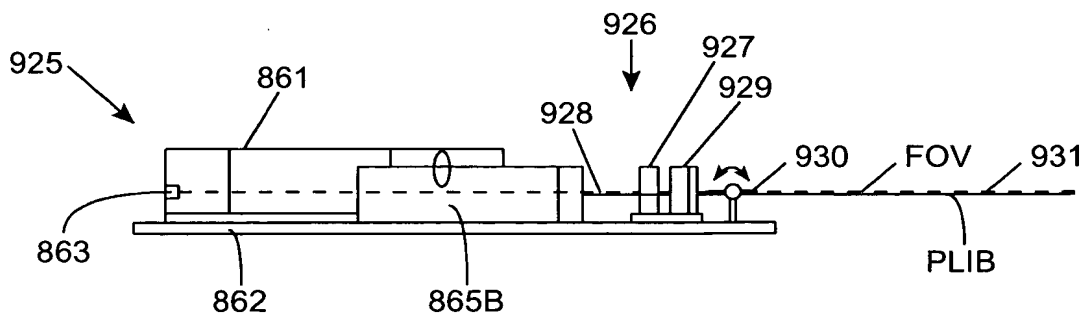
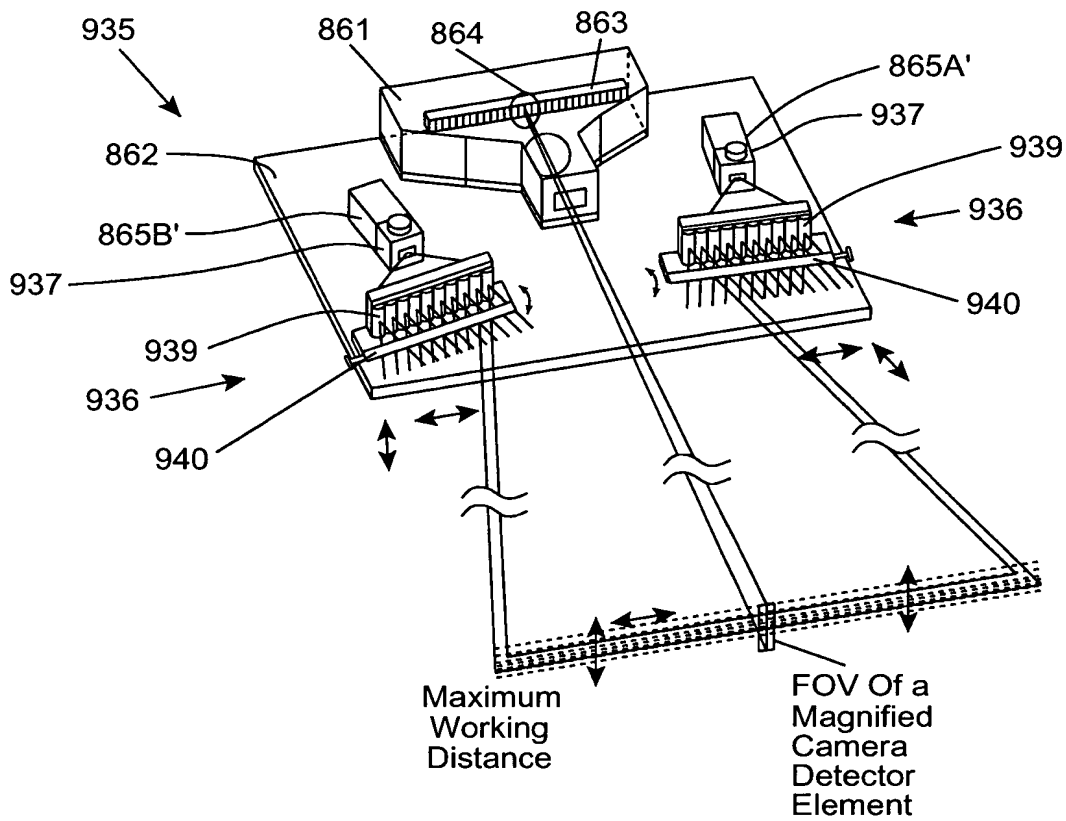


FIG. 1I25G2



* Lateral And
Transverse
Micro-oscillation
Of PLIB

FIG. 1I25H1

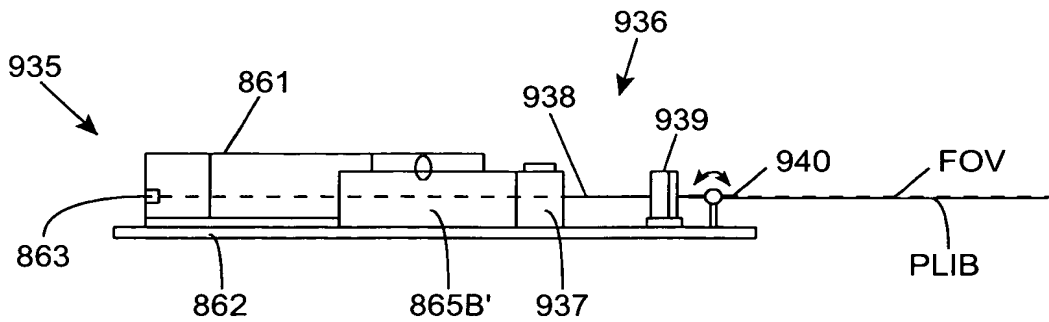


FIG. 1I25H2

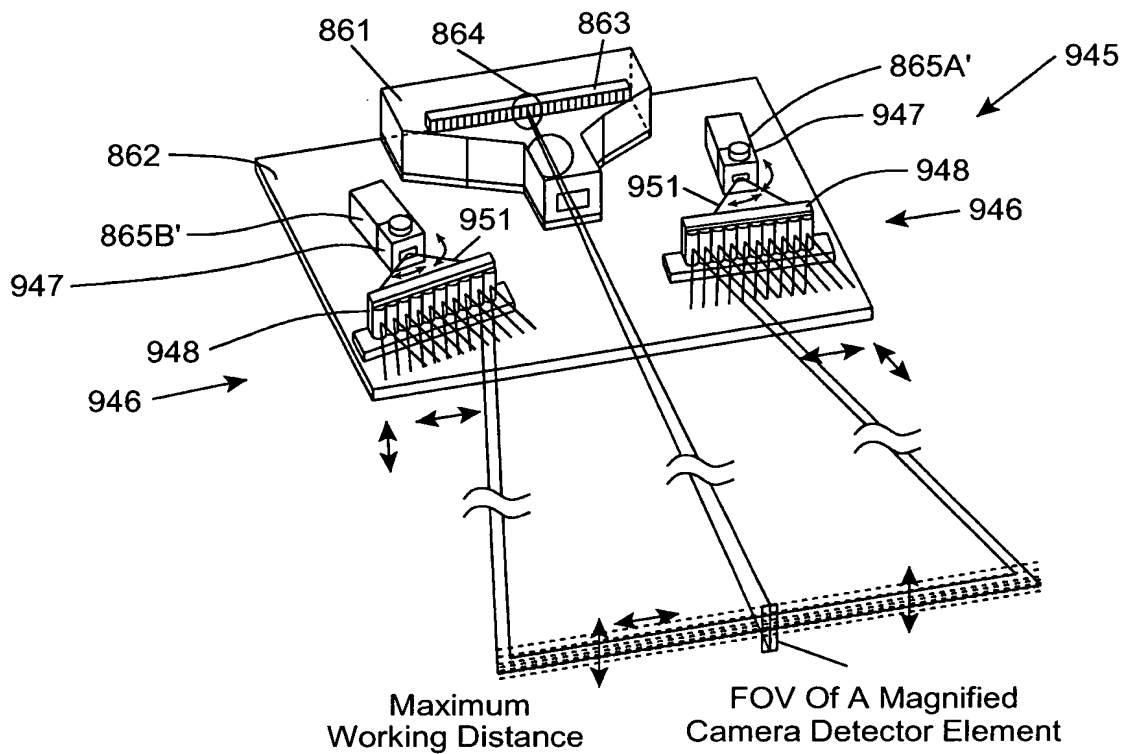


FIG. 1125I1

* Lateral And
 Transverse
 Micro-oscillation
 Of PLIB

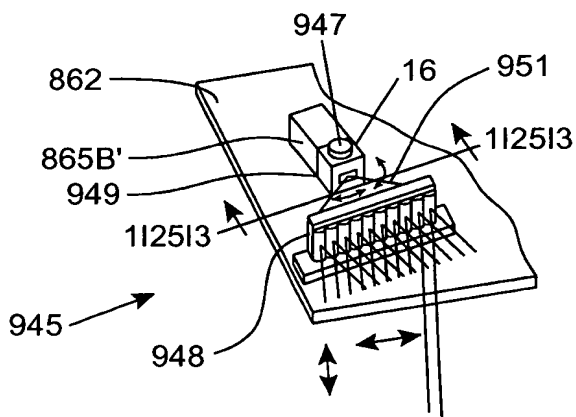


FIG. 1125I2

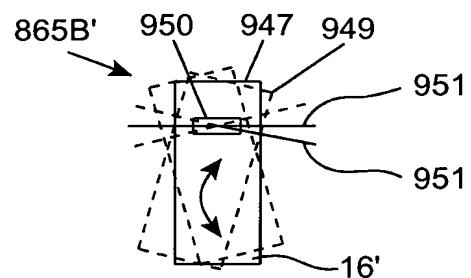


FIG. 1125I3

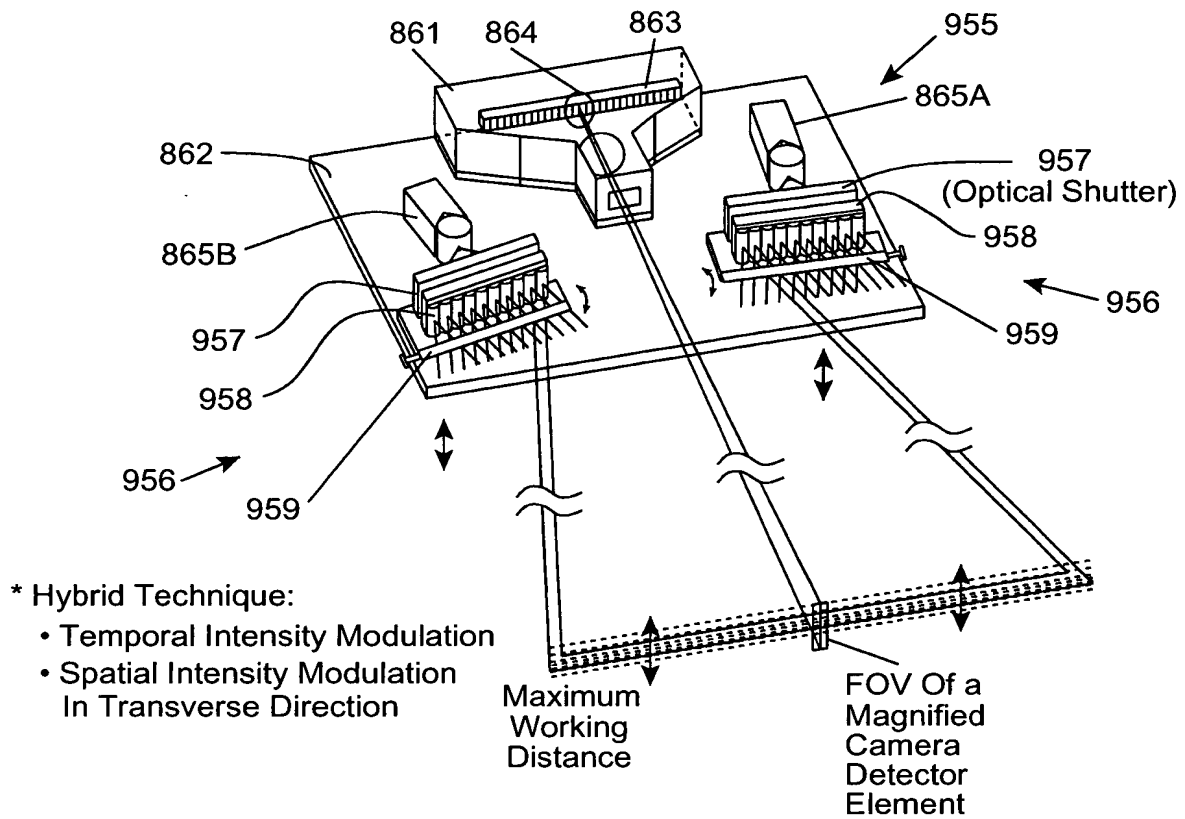


FIG. 1I25J1

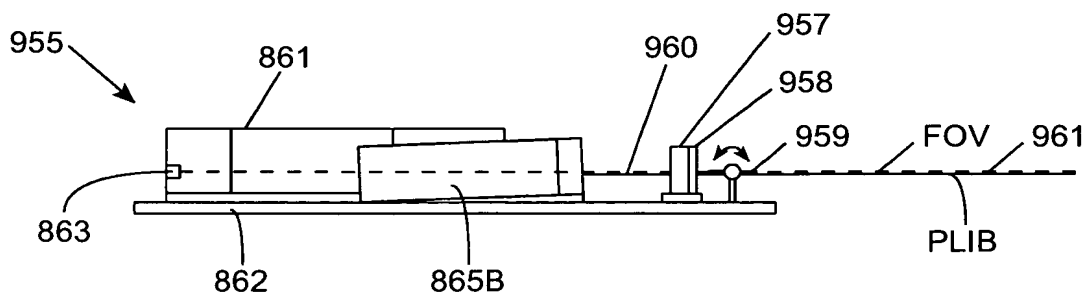


FIG. 1I25J2

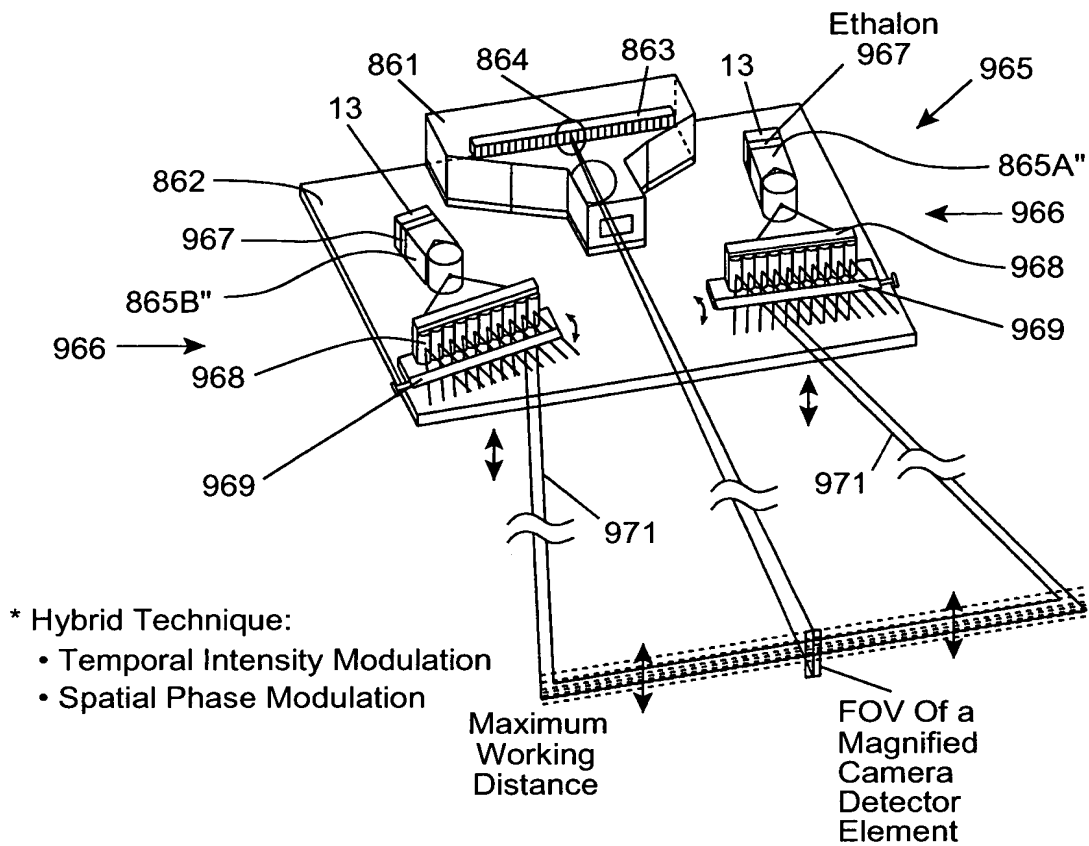


FIG. 1I25K1

* Transverse Micro-oscillation Of PLIB

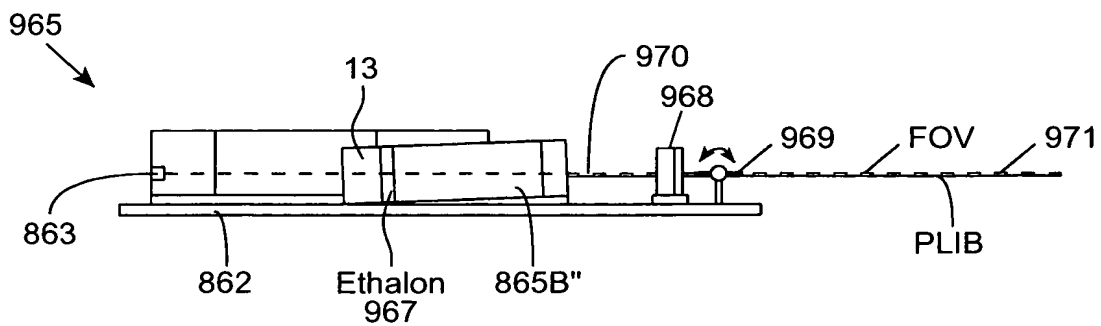
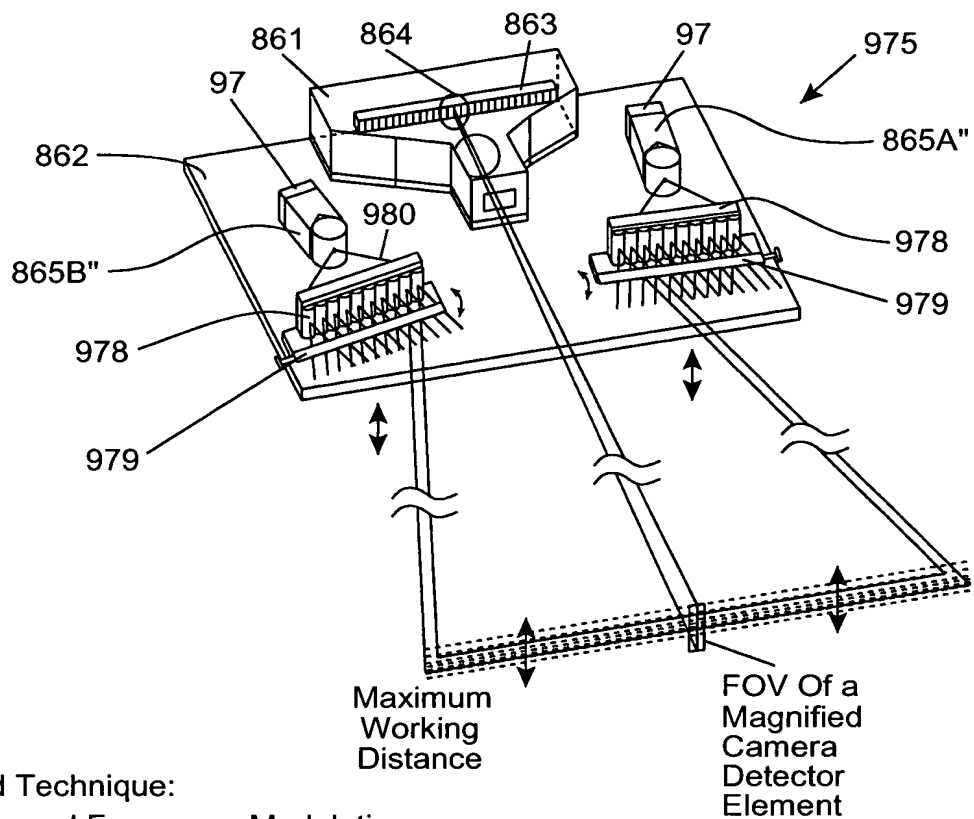


FIG. 1I25K2



- * Hybrid Technique:
- Temporal Frequency Modulation
 - Spatial Phase Modulation

- * Transverse Micro-oscillation Of PLIB

FIG. 1I25L1

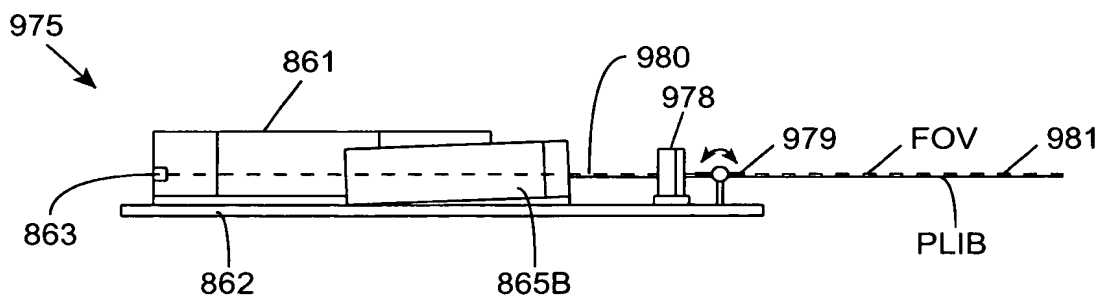
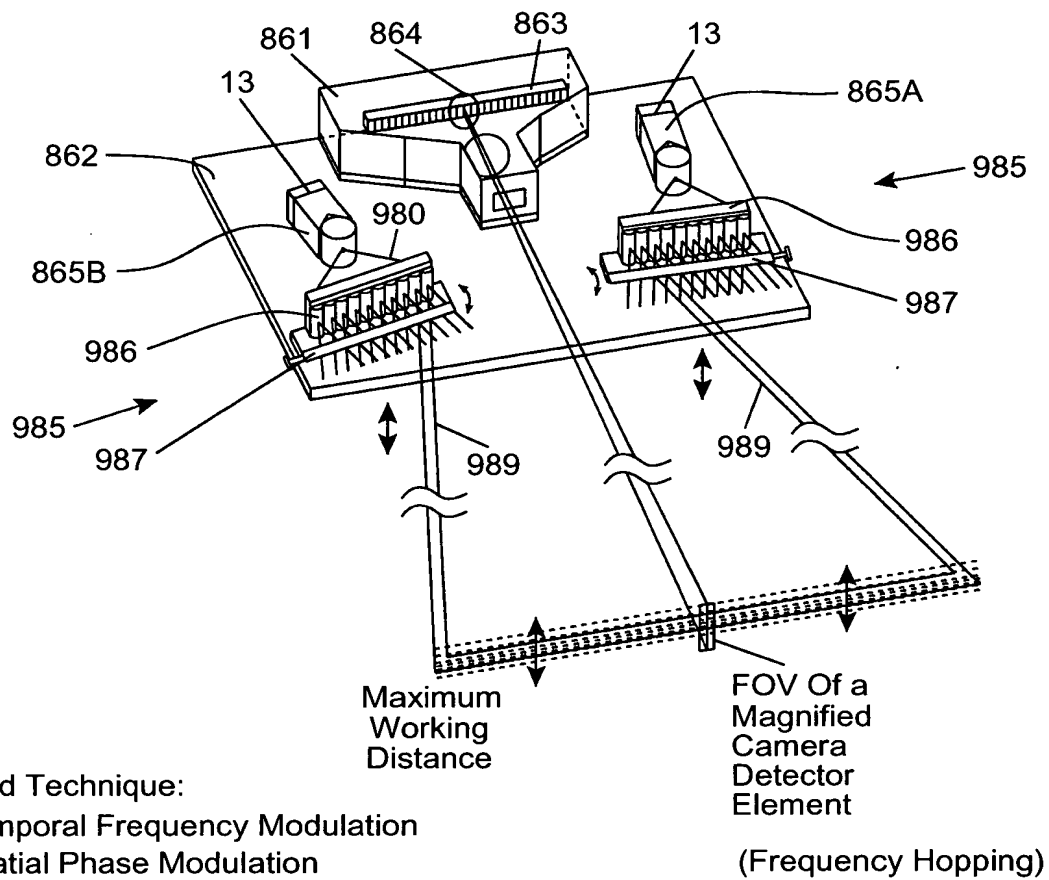


FIG. 1I25L2



- * Hybrid Technique:
- Temporal Frequency Modulation
 - Spatial Phase Modulation

FIG. 1I25M1

- * Transverse Micro-oscillation Of PLIB

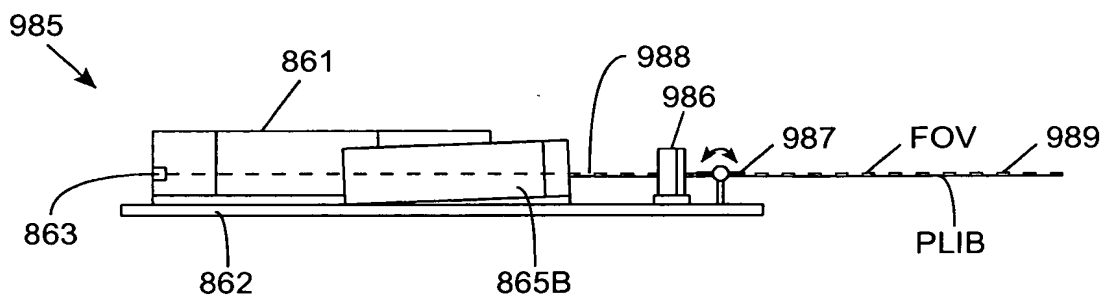
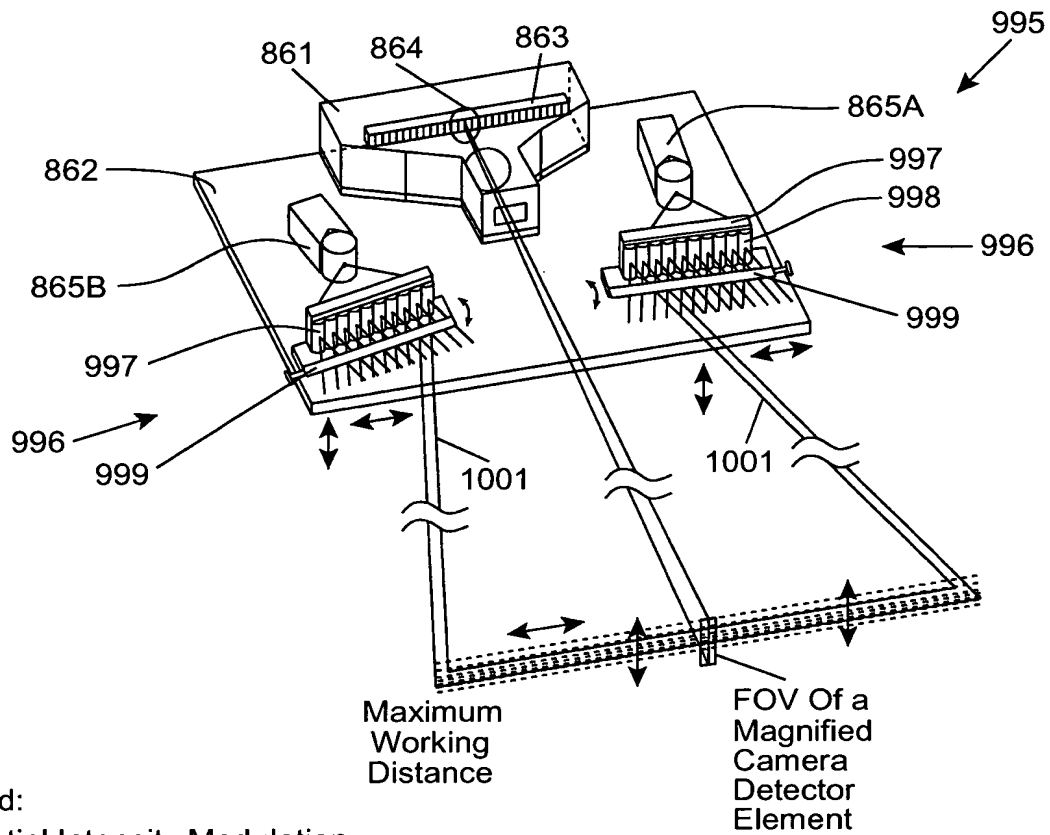
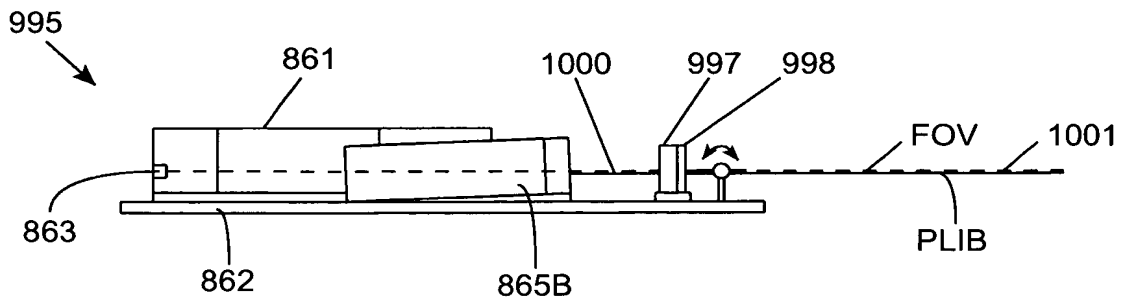


FIG. 1I25M2



- * Hybrid:
 - Spatial Intensity Modulation
 - Spatial Phase Modulation

- * Lateral And Transverse Micro-oscillation Of PLIB



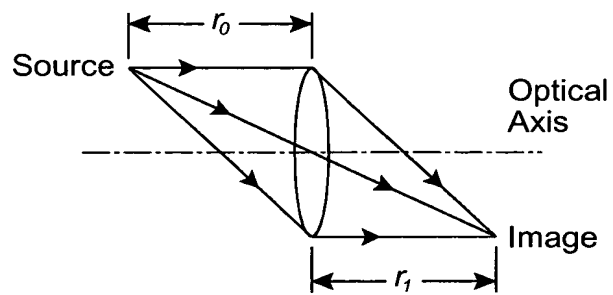


FIG. 1H1

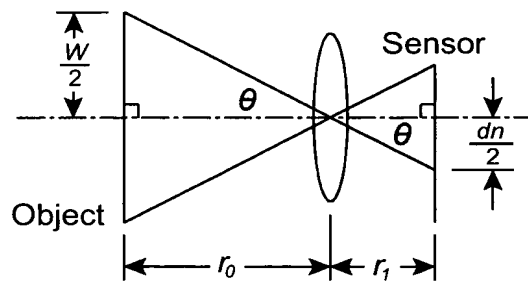


FIG. 1H2

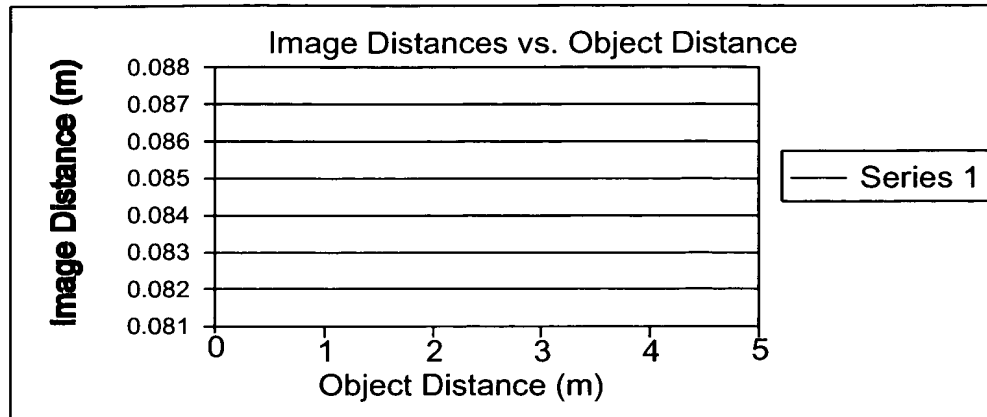


FIG. 1H3

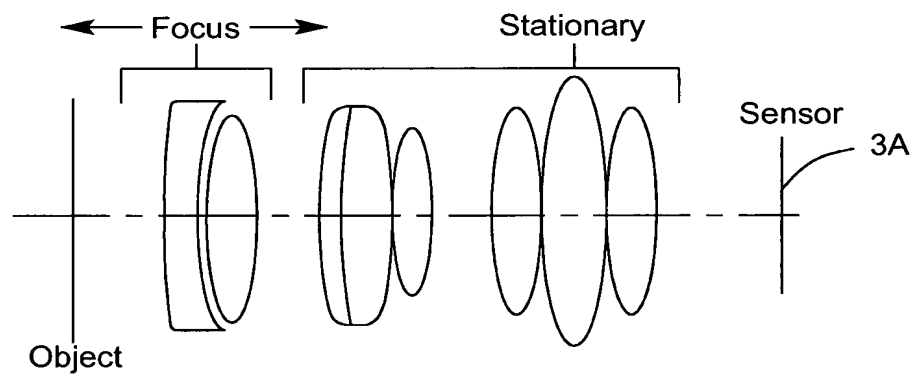


FIG. 1H4

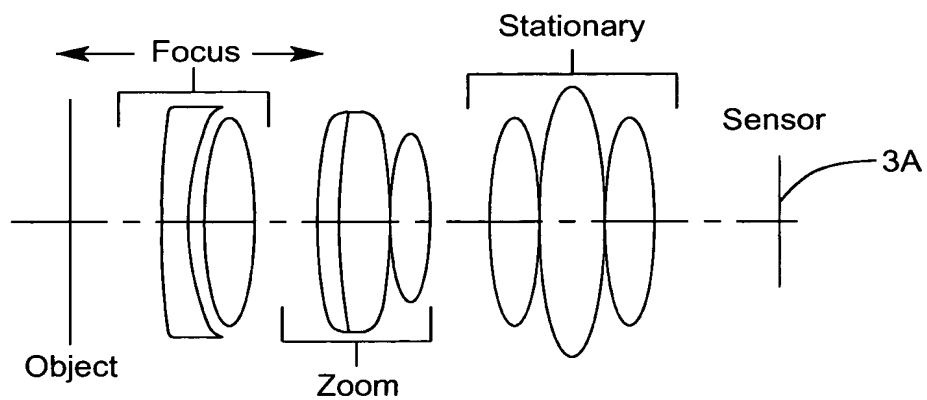
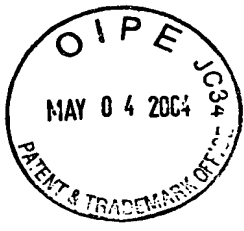


FIG. 1H5



Fixed Focal Length
Lens Cases

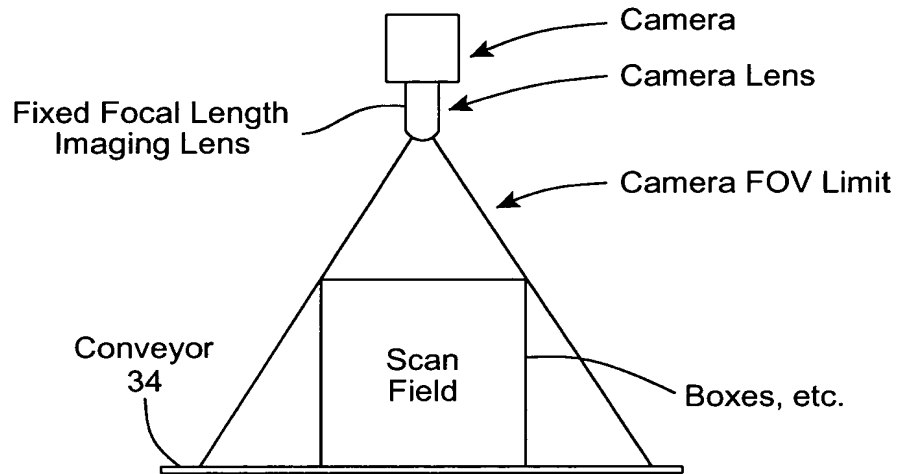


FIG. 1K1

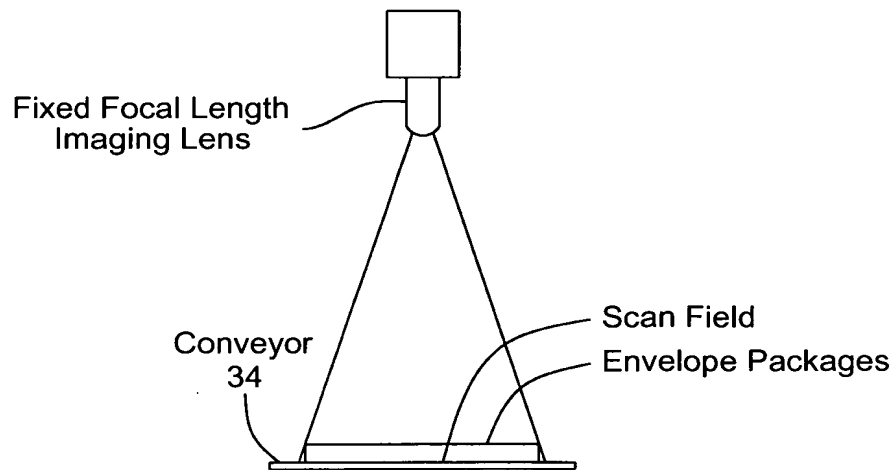


FIG. 1K2

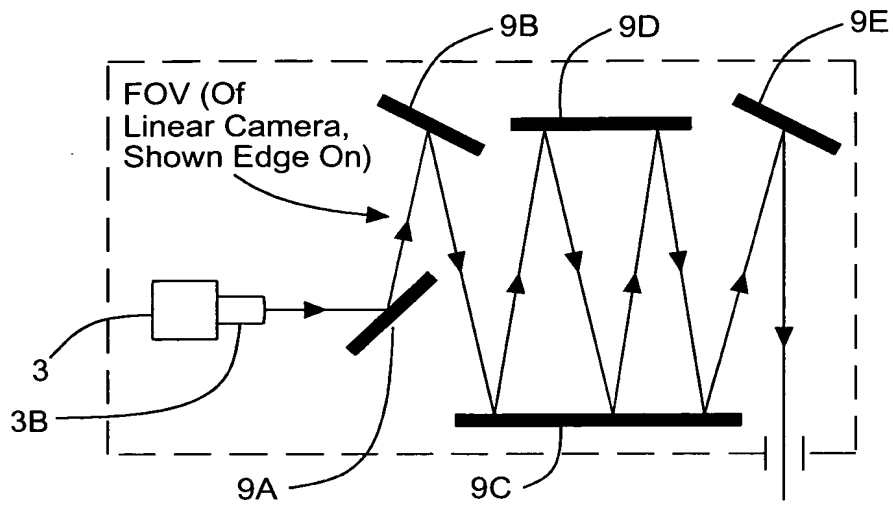


FIG. 1L1

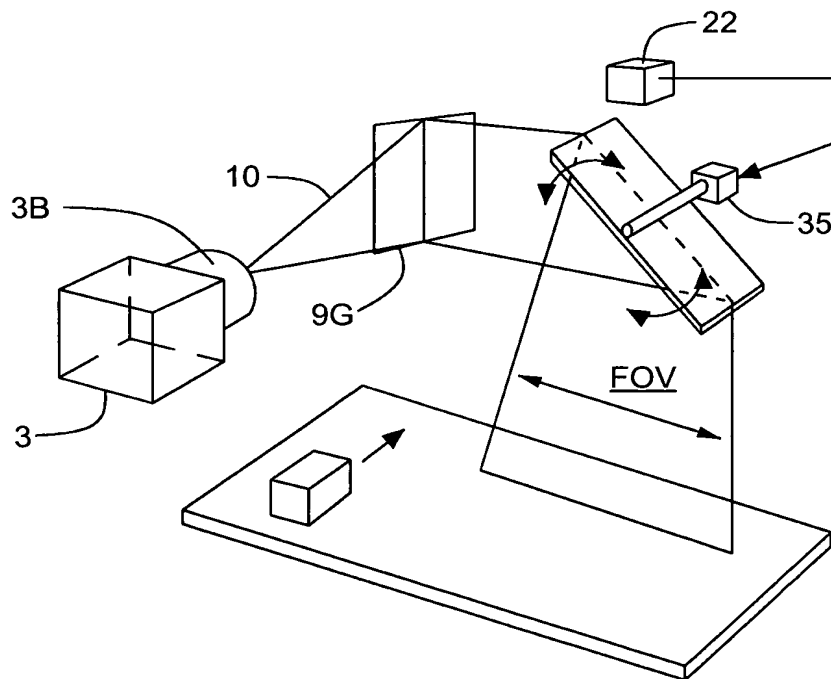


FIG. 1L2



Pixel Power Density vs. Object Distance (General Example)

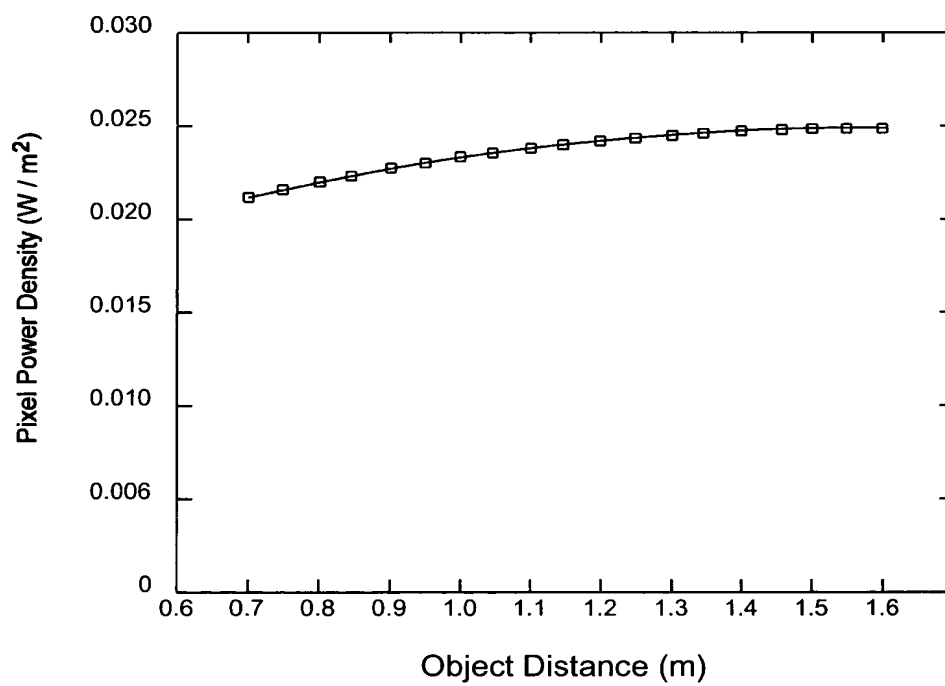


FIG. 1M1

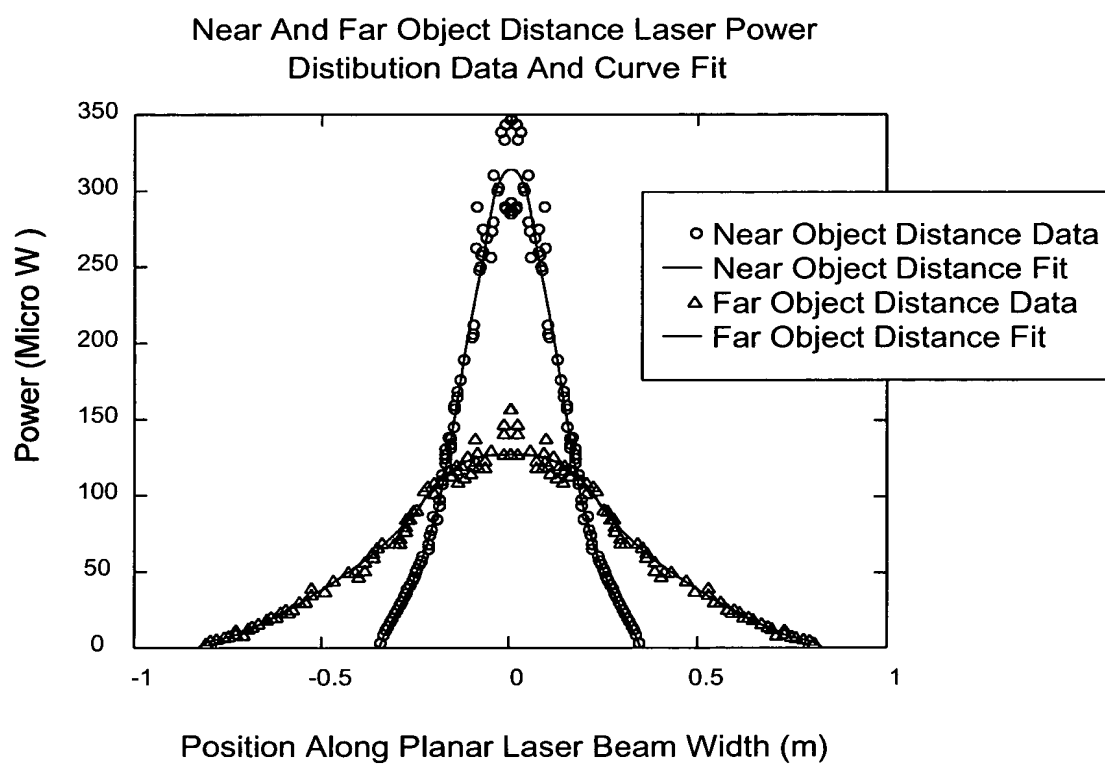


FIG. 1M2



Planar Laser Beam Width vs. Object Distance

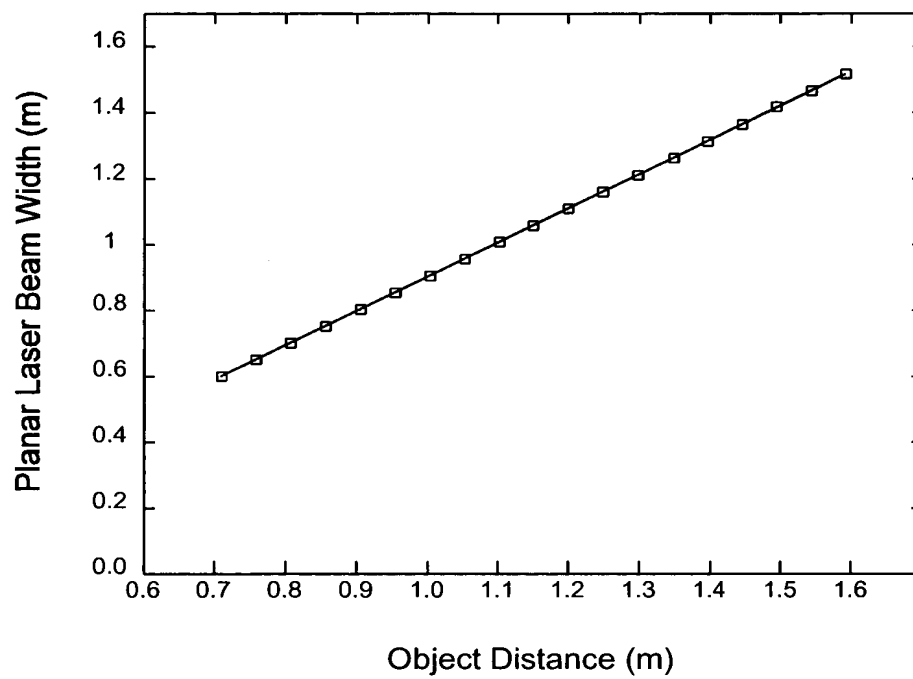


FIG. 1M3



Planar Laser Beam Height vs.
Object Distance (Far Object Distance Focus)

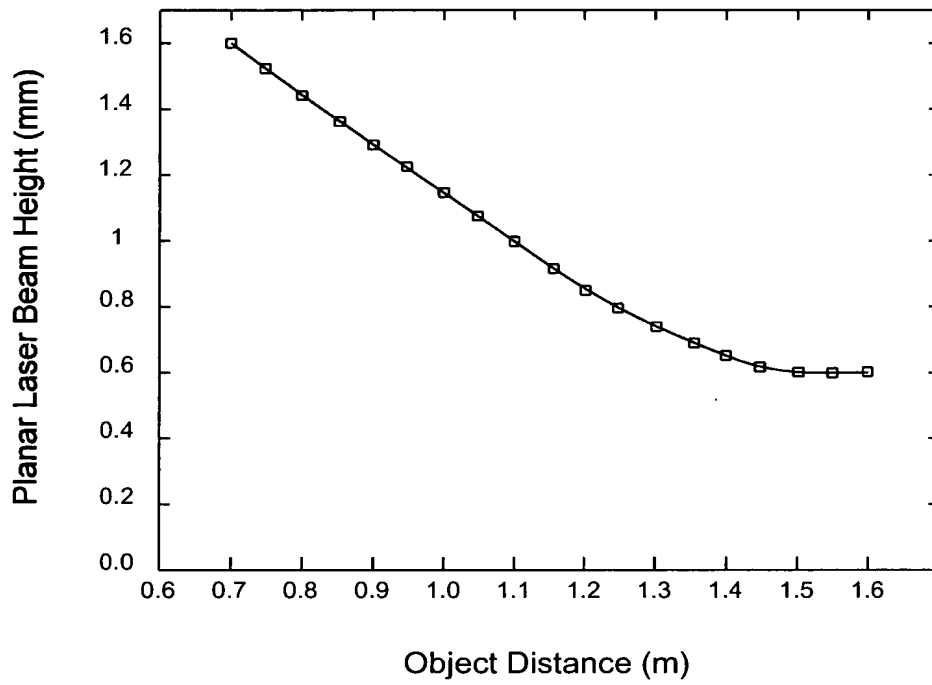


FIG. 1M4

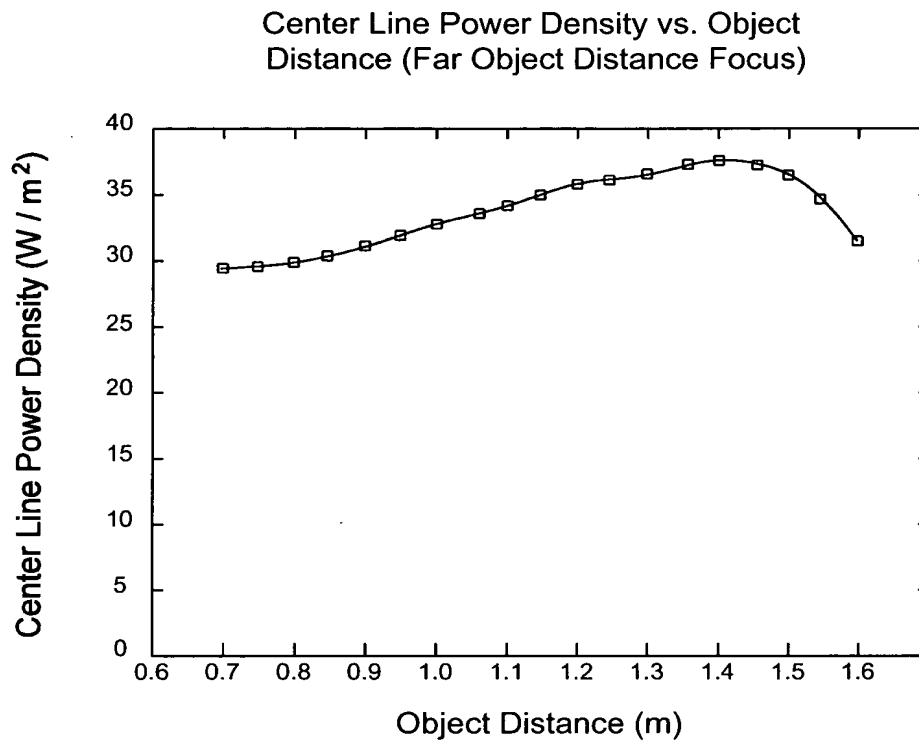


FIG. 1N

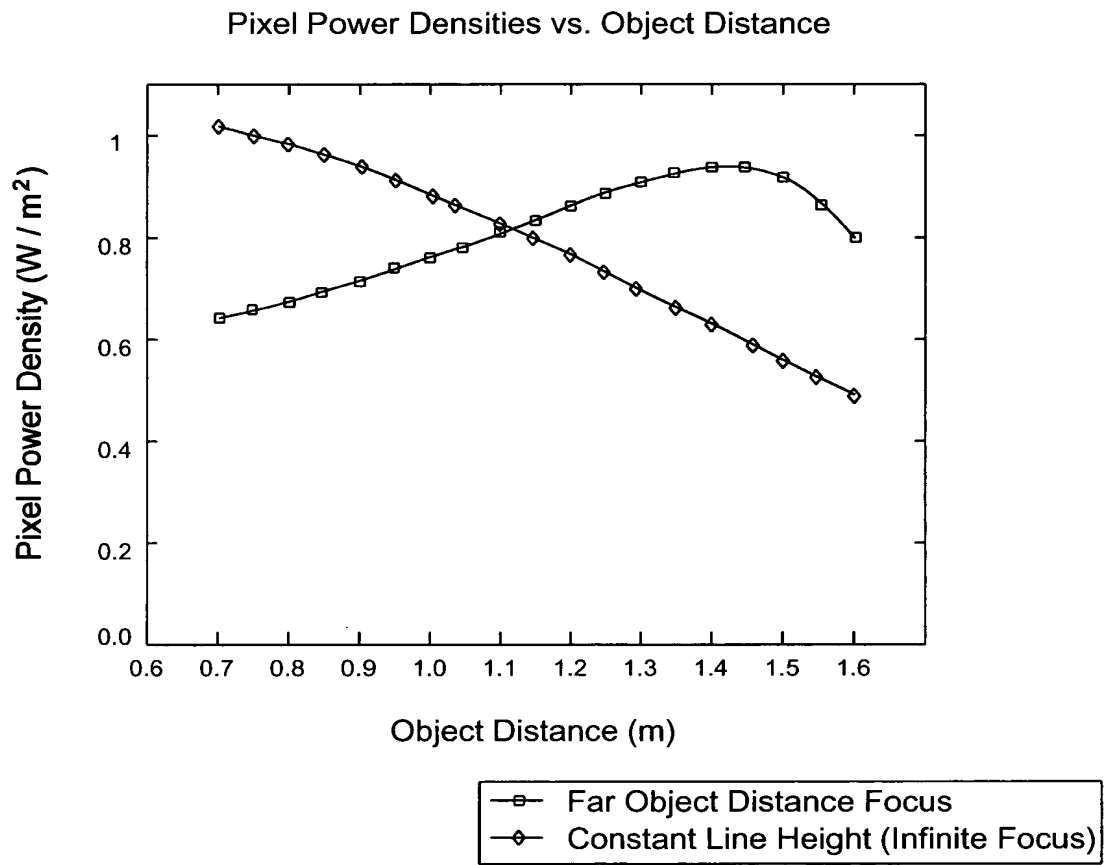


FIG. 10

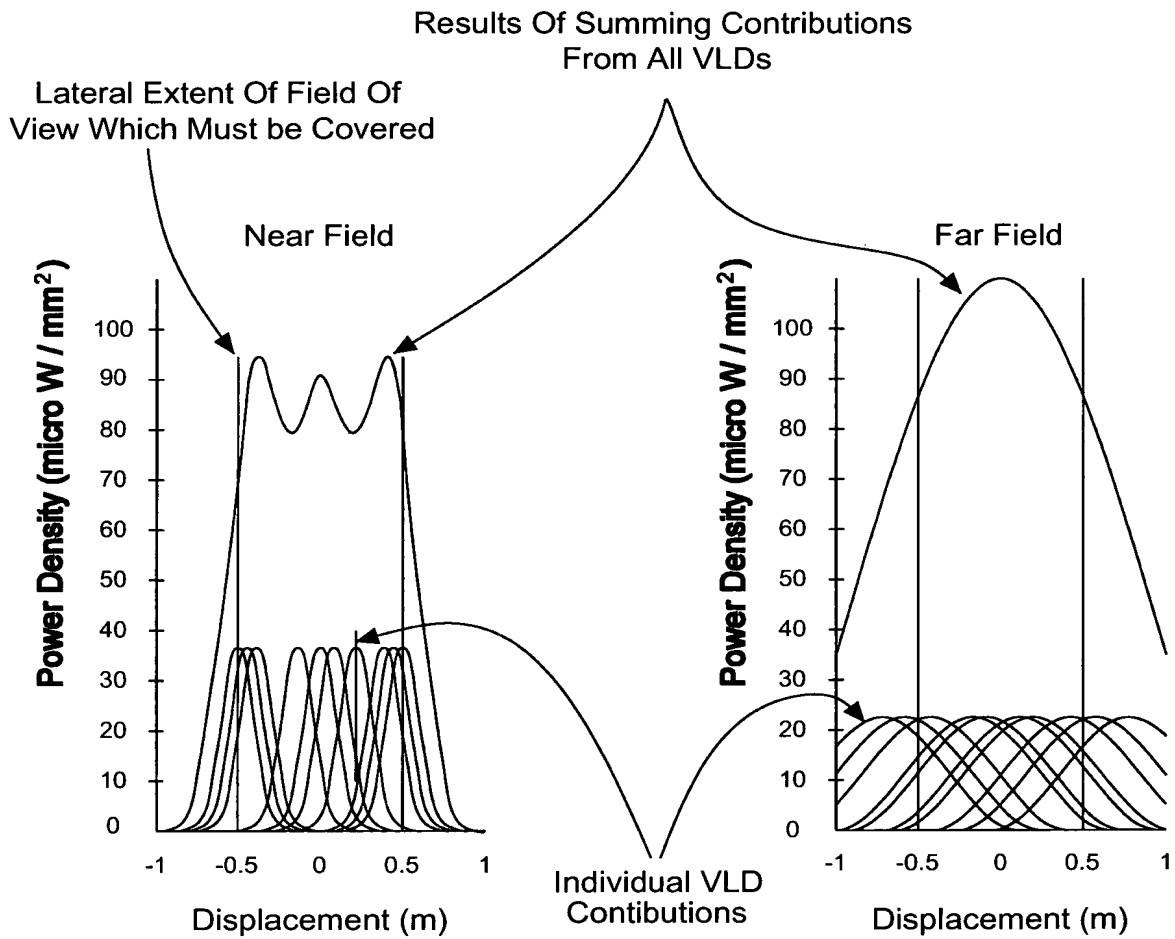


FIG. 1P1

FIG. 1P2

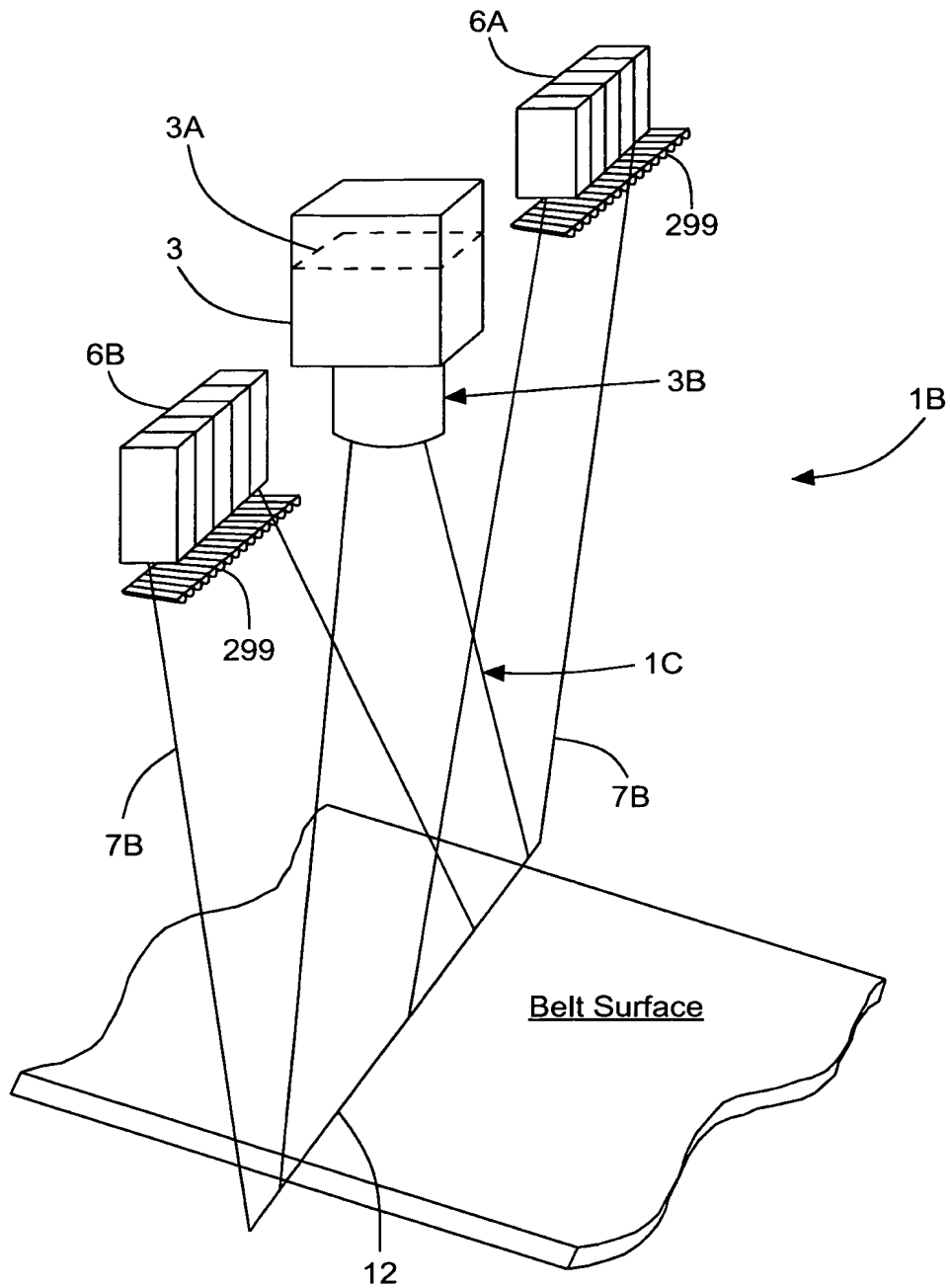


FIG. 1Q1

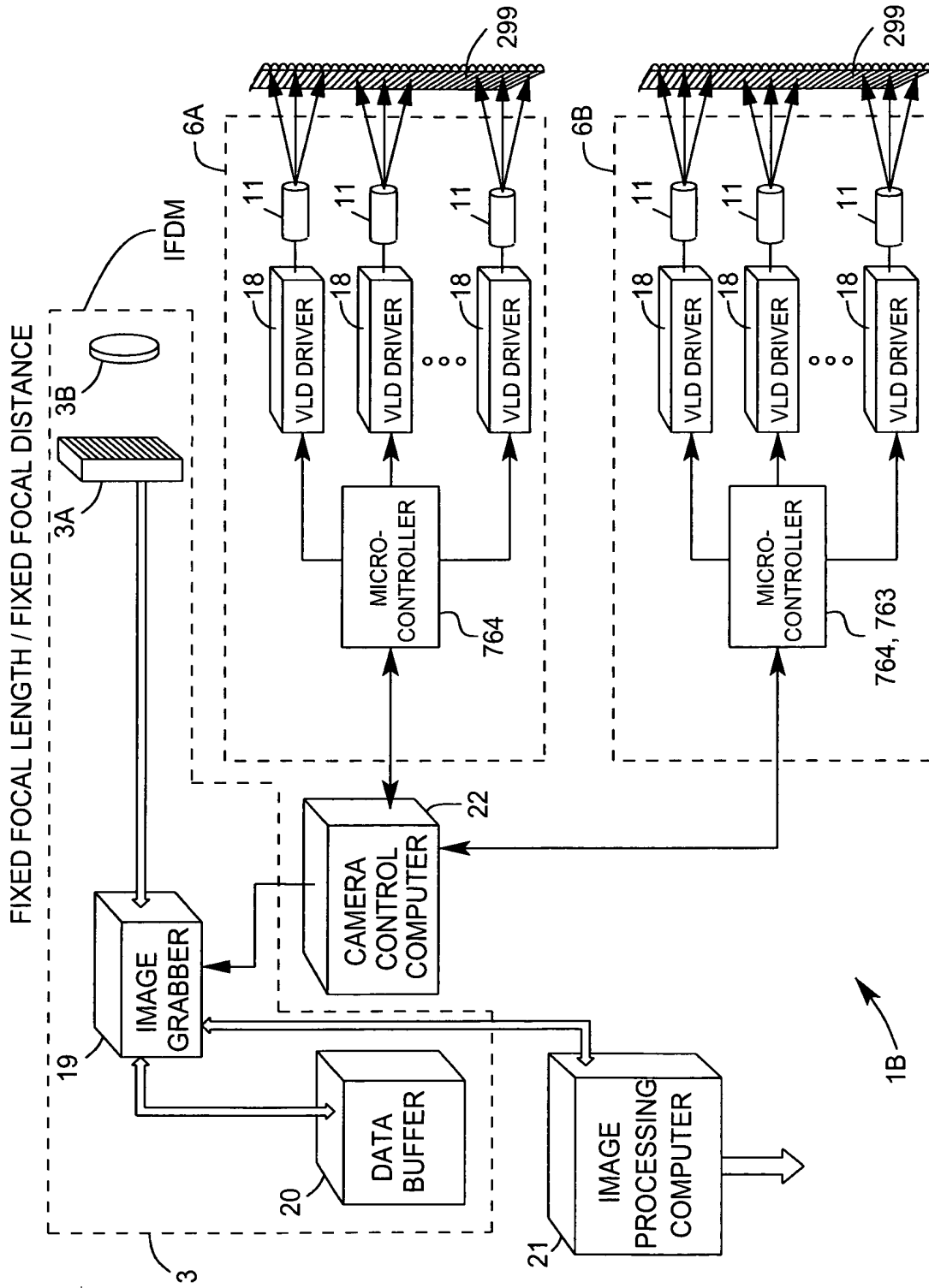


FIG. 1Q2

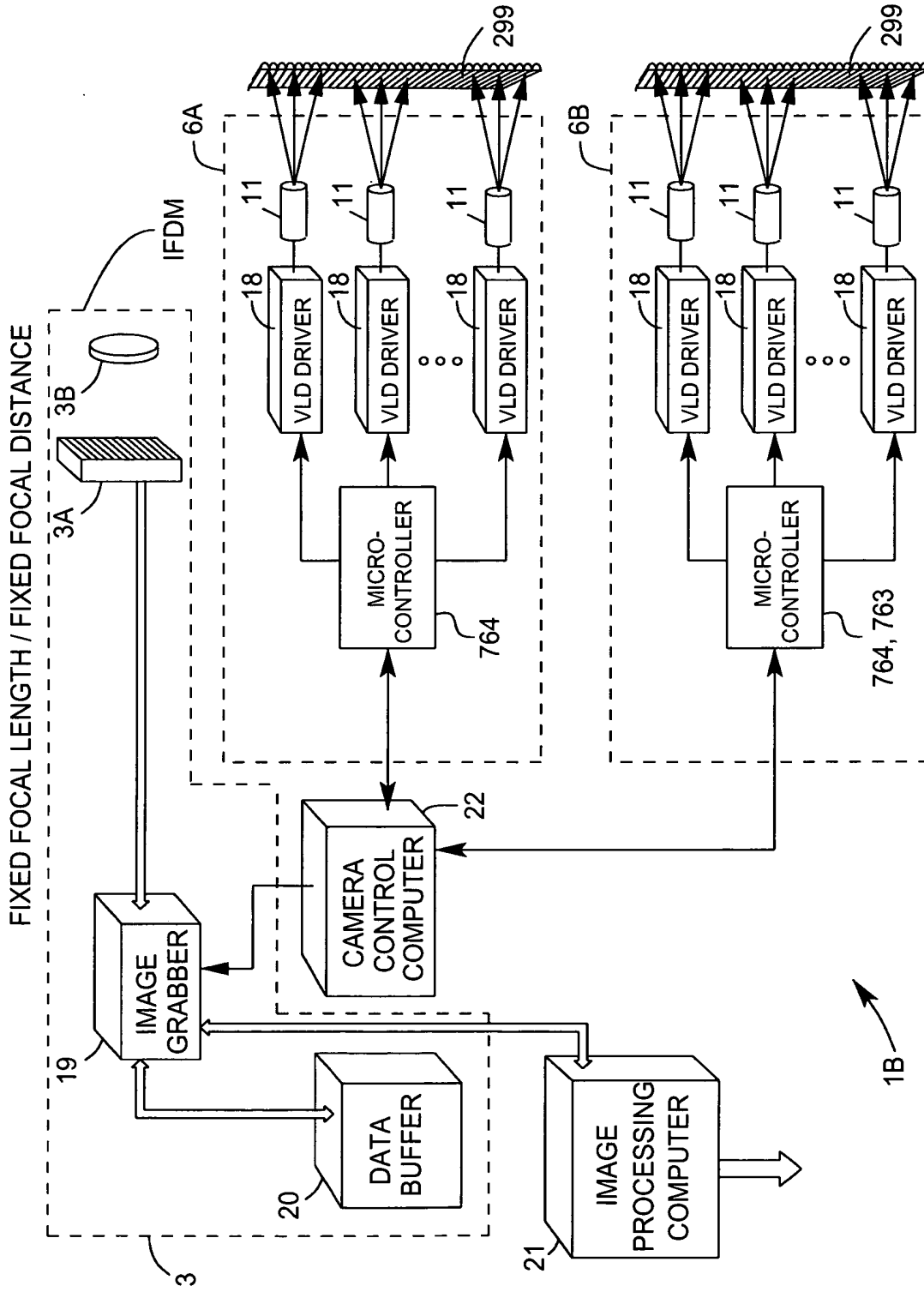


FIG. 1Q2

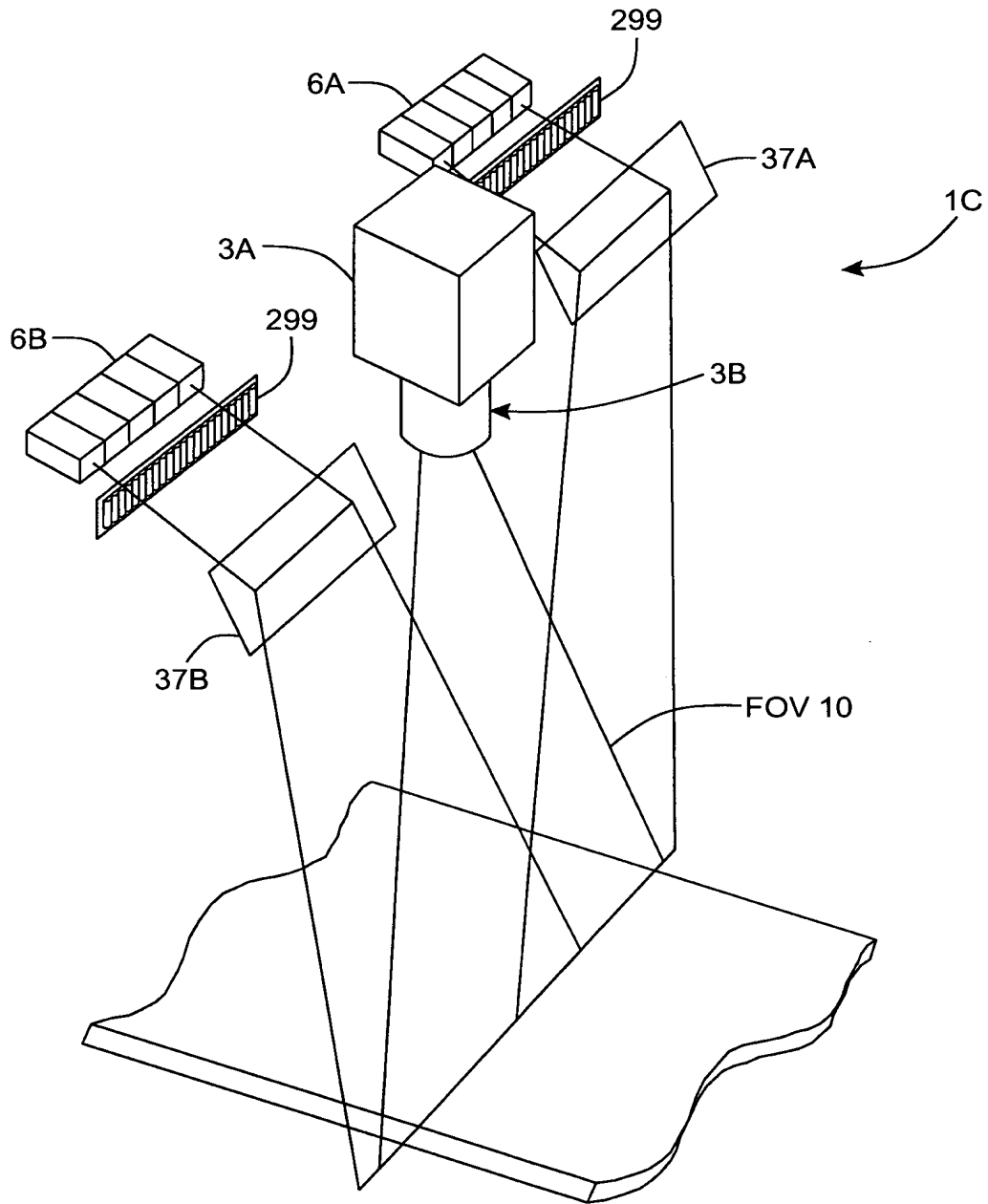


FIG. 1R1

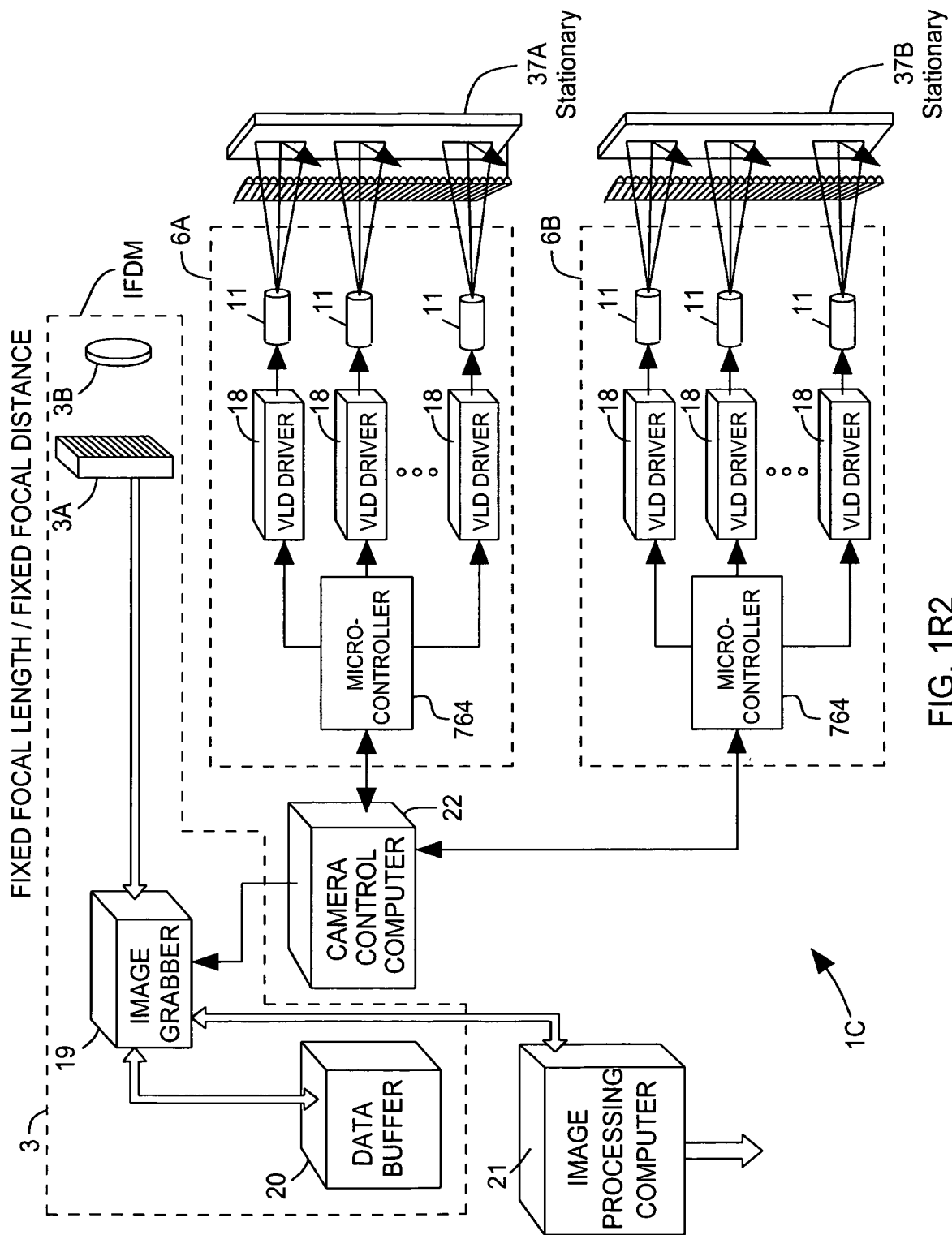


FIG. 1R2

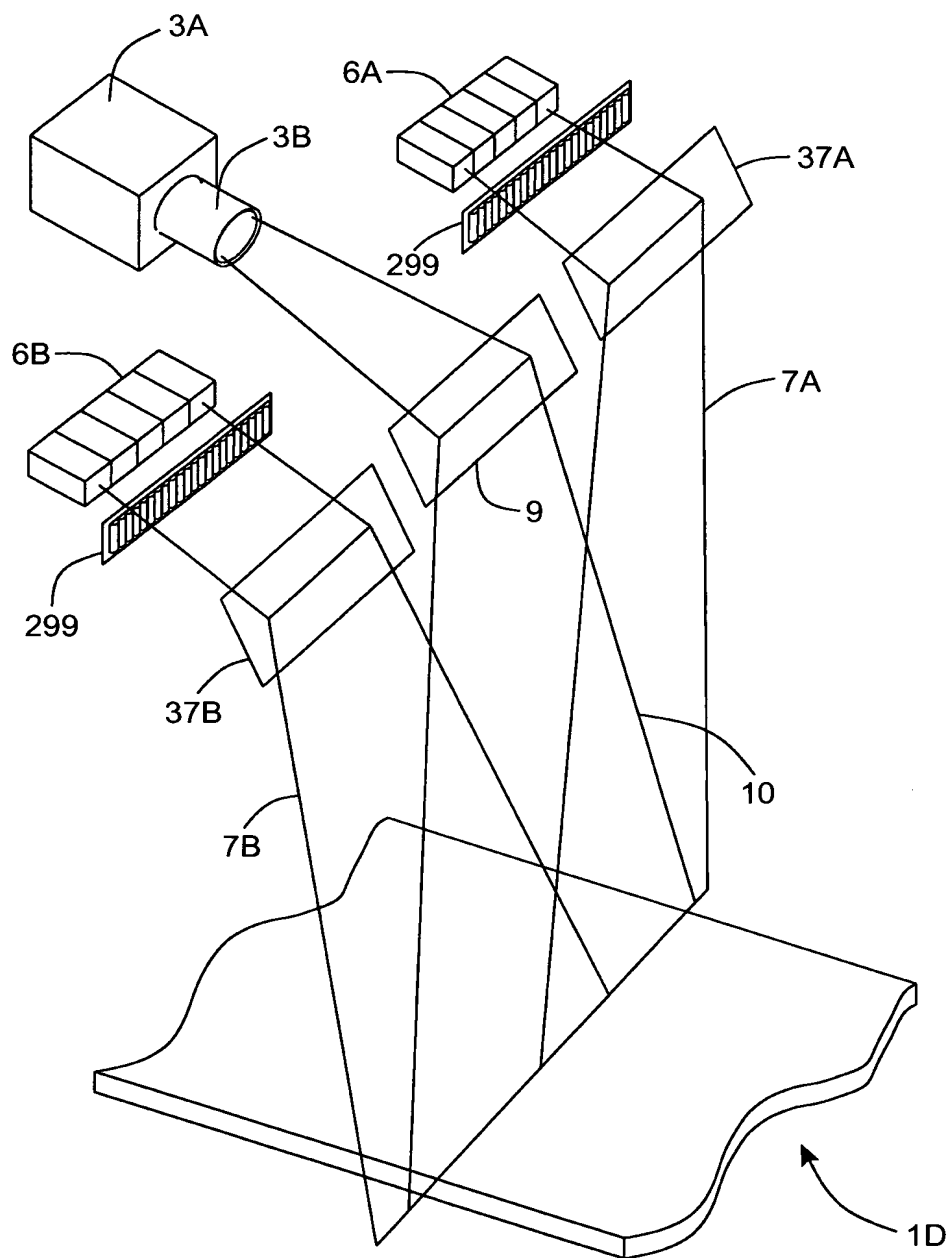


FIG. 1S1

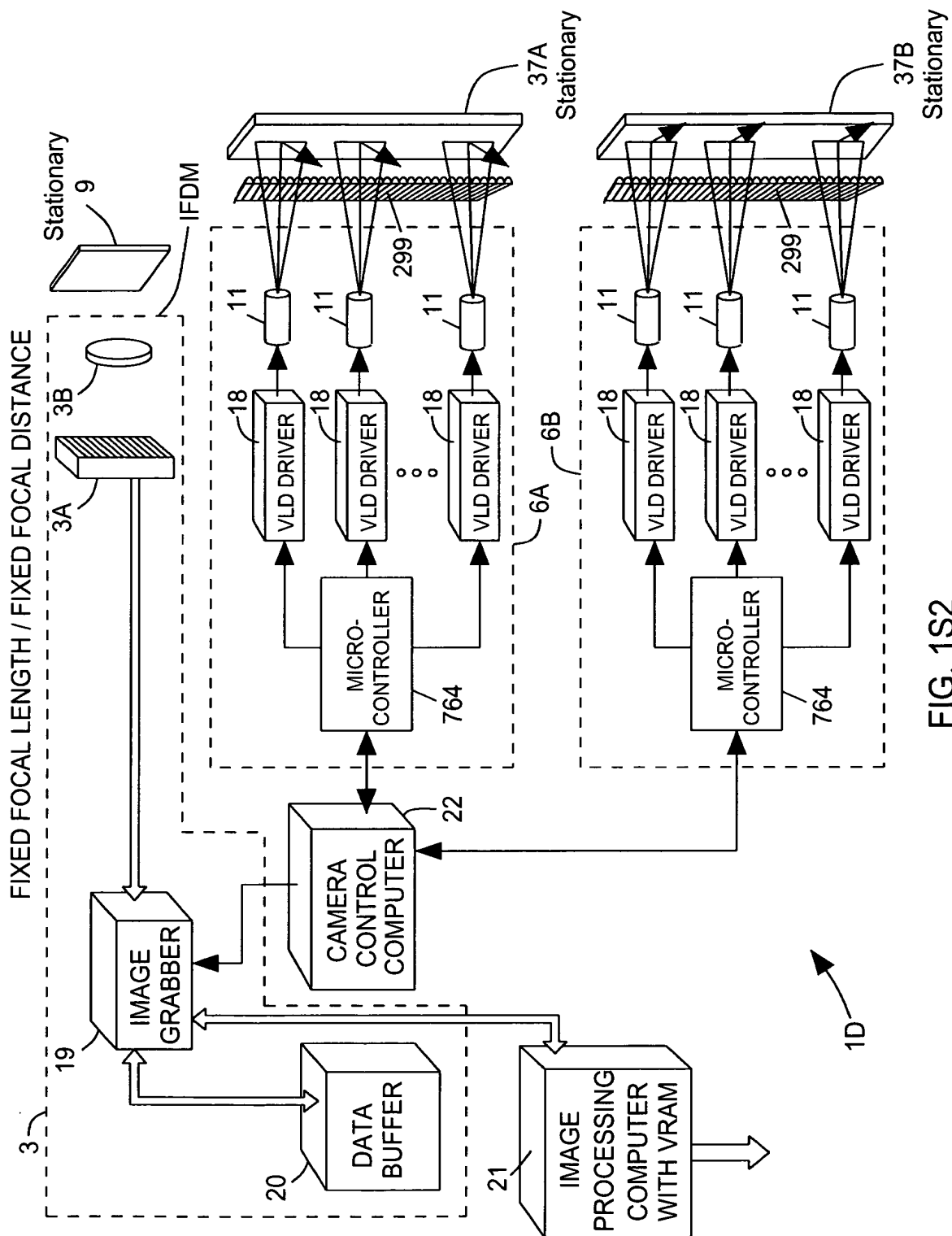


FIG. 1S2

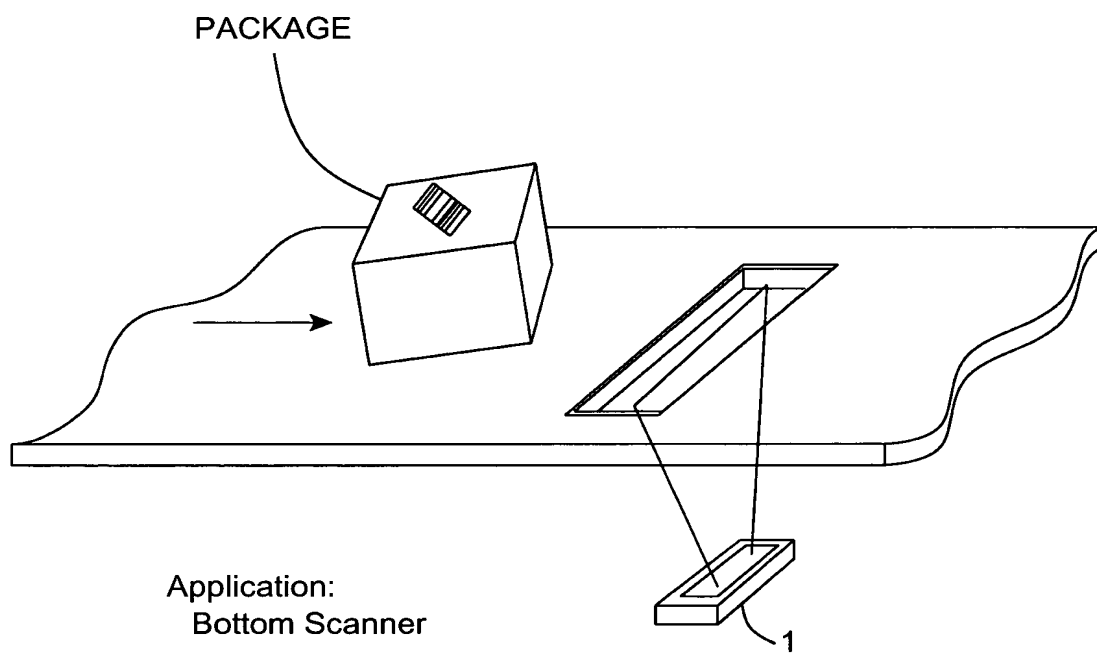
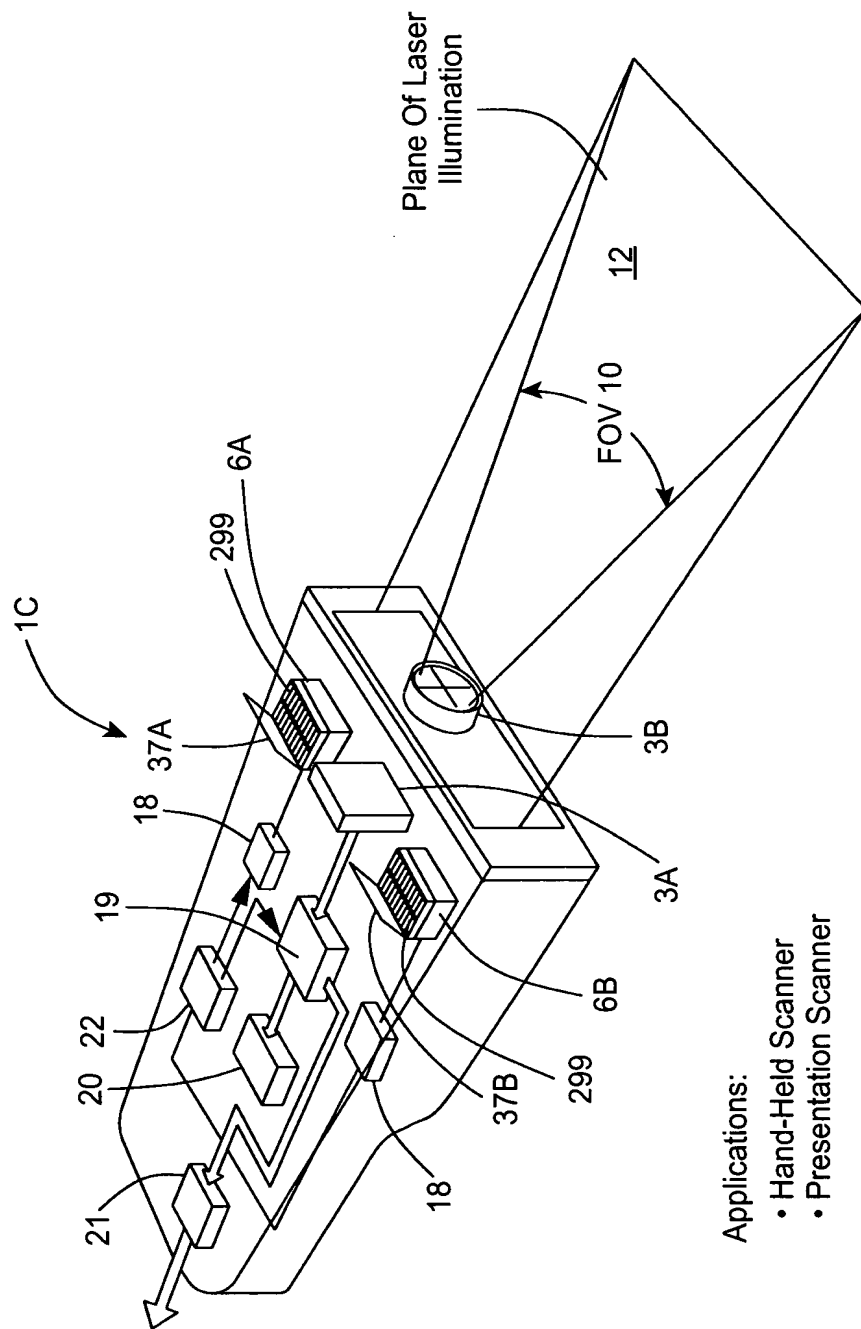


FIG. 1T



Applications:
 • Hand-Held Scanner
 • Presentation Scanner

FIG. 1U

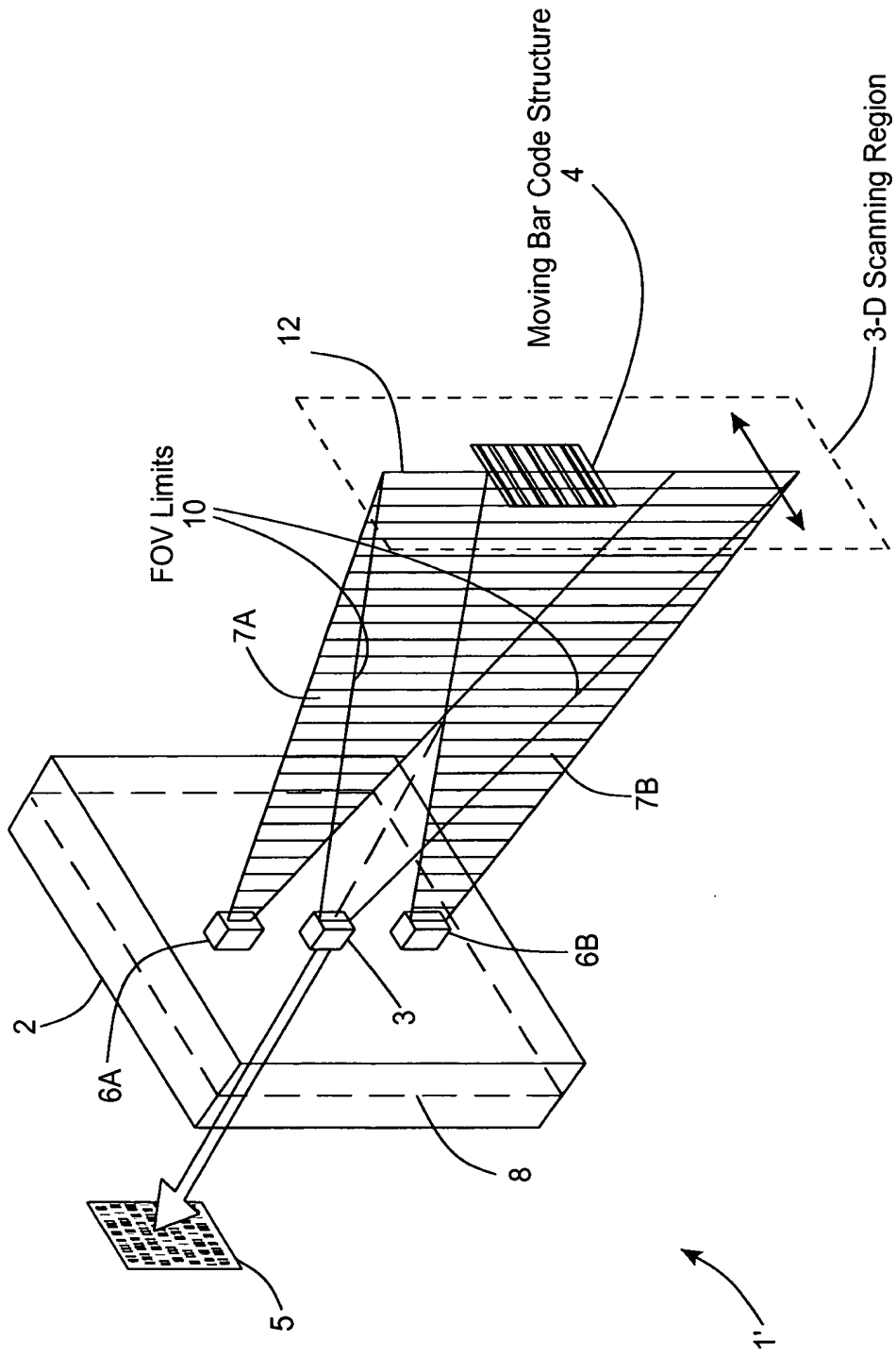


FIG. 1V1

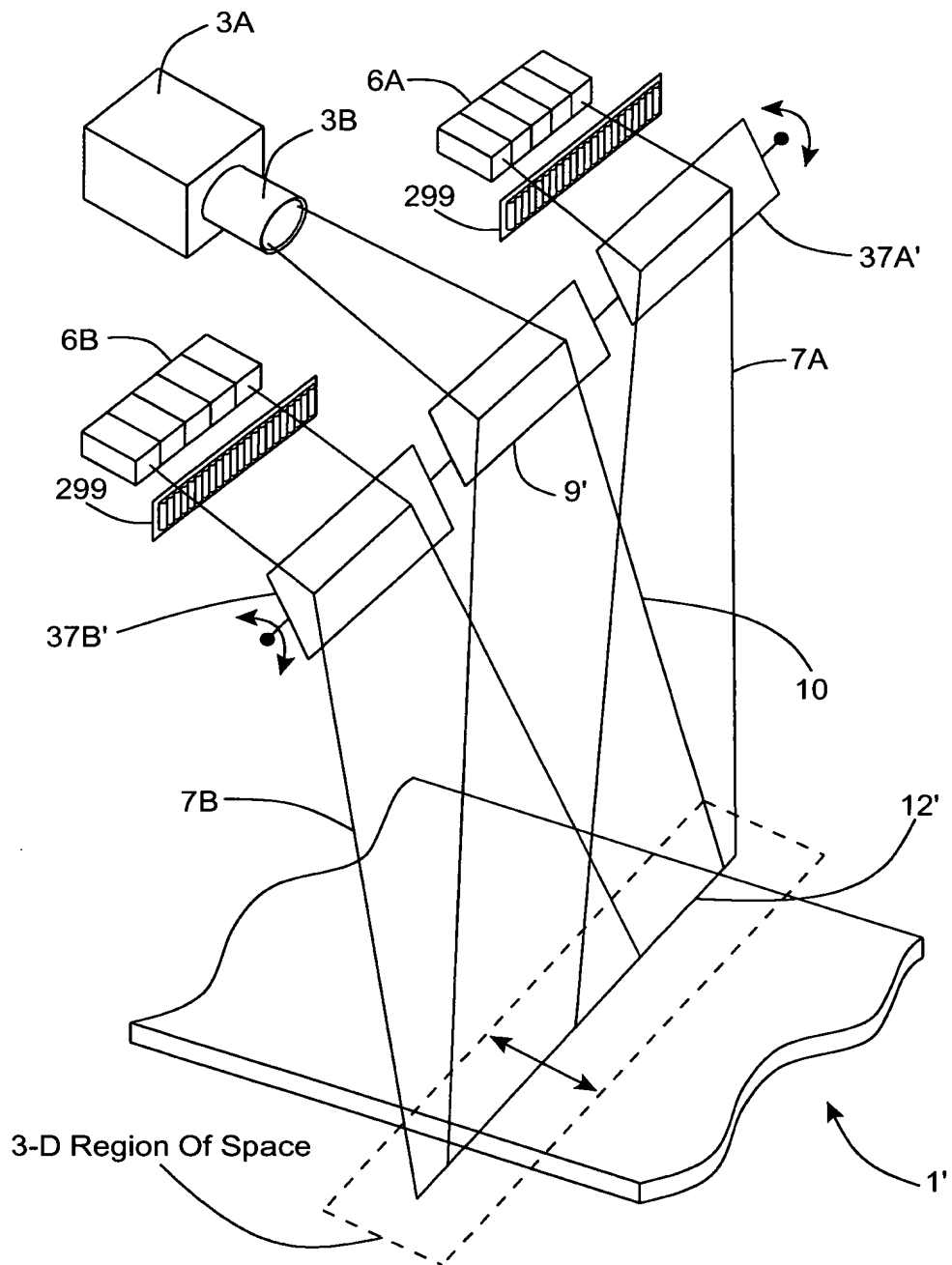


FIG. 1V2

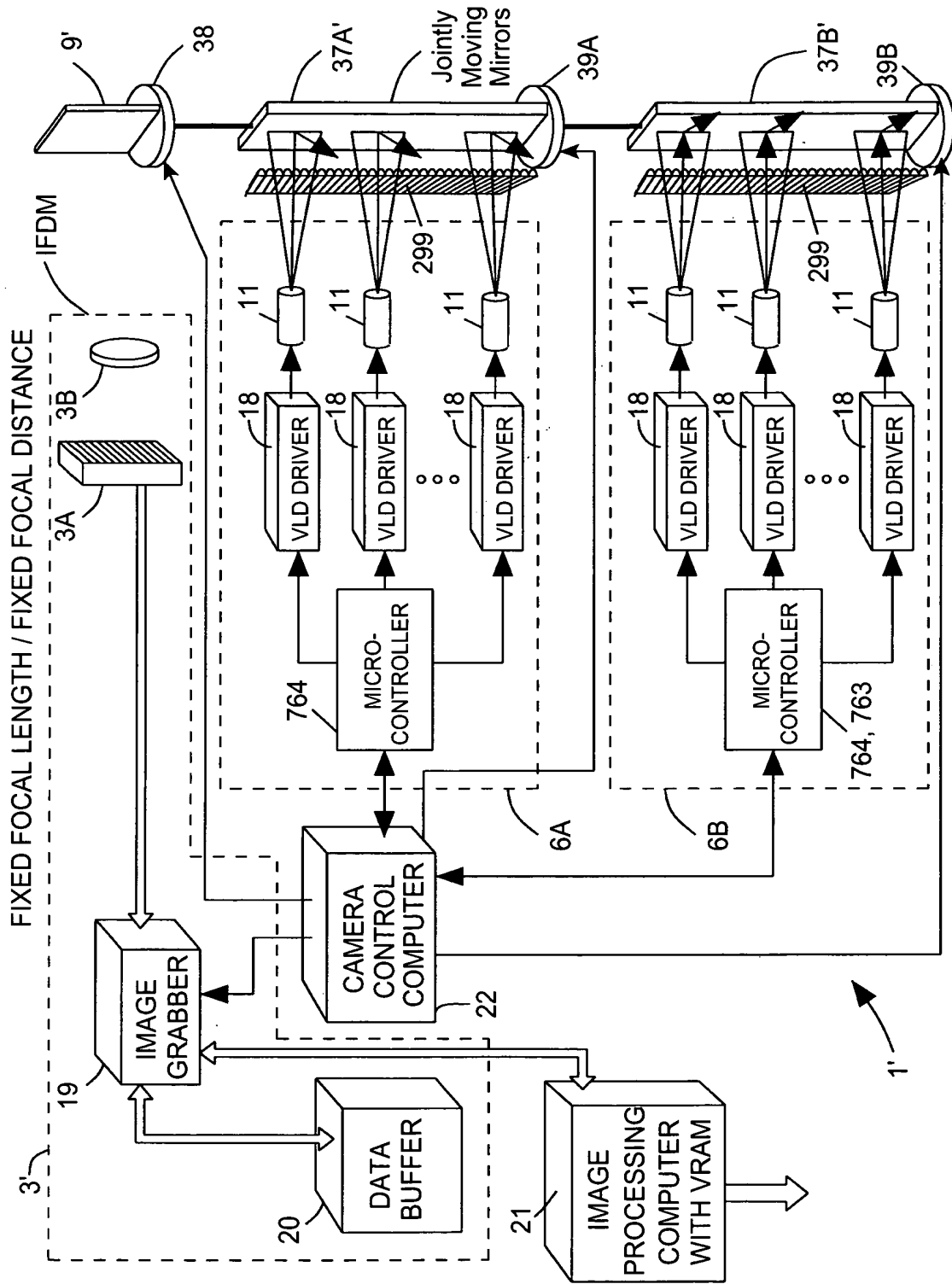


FIG. 1V3

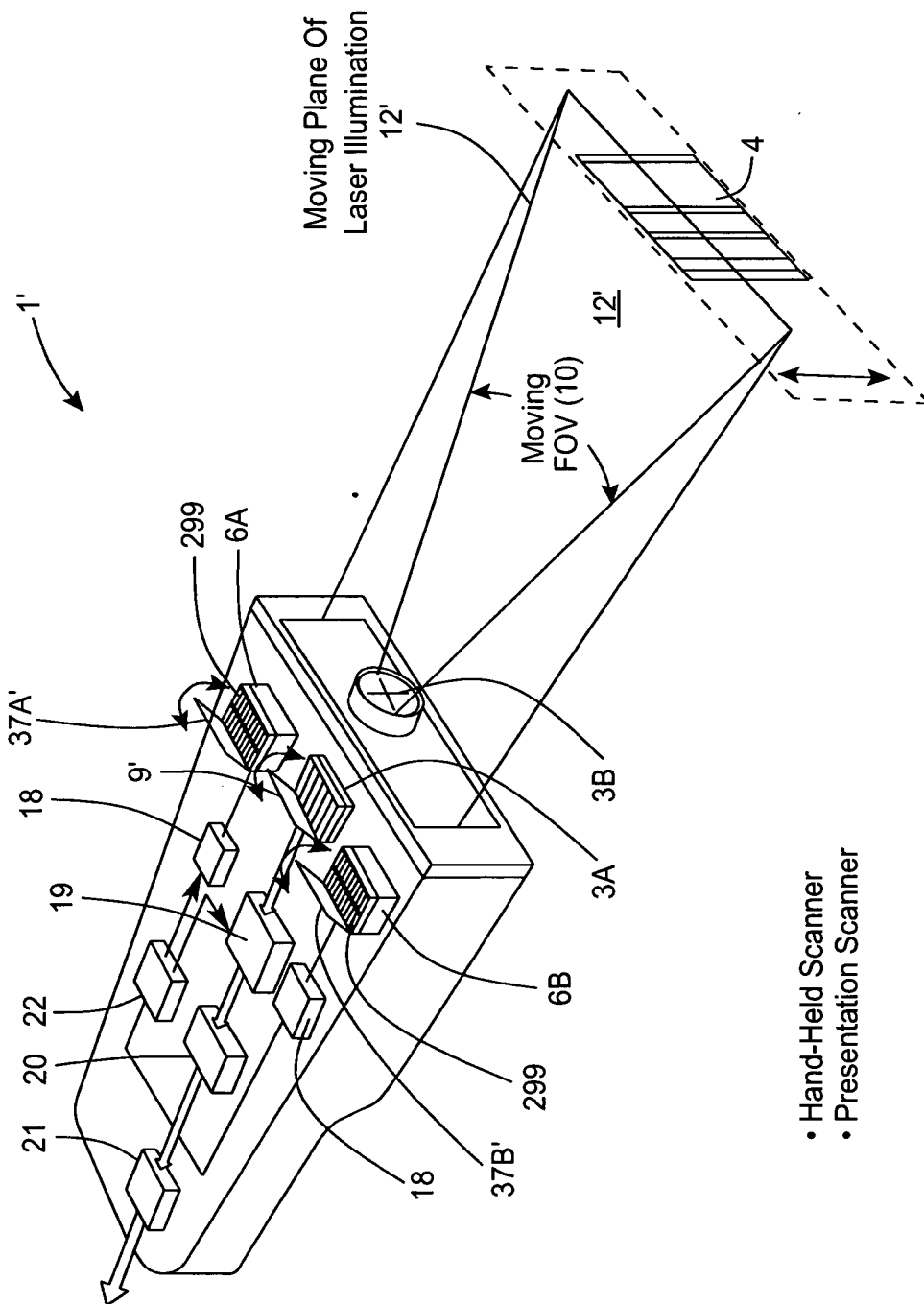


FIG. 1V4

- Hand-Held Scanner
- Presentation Scanner

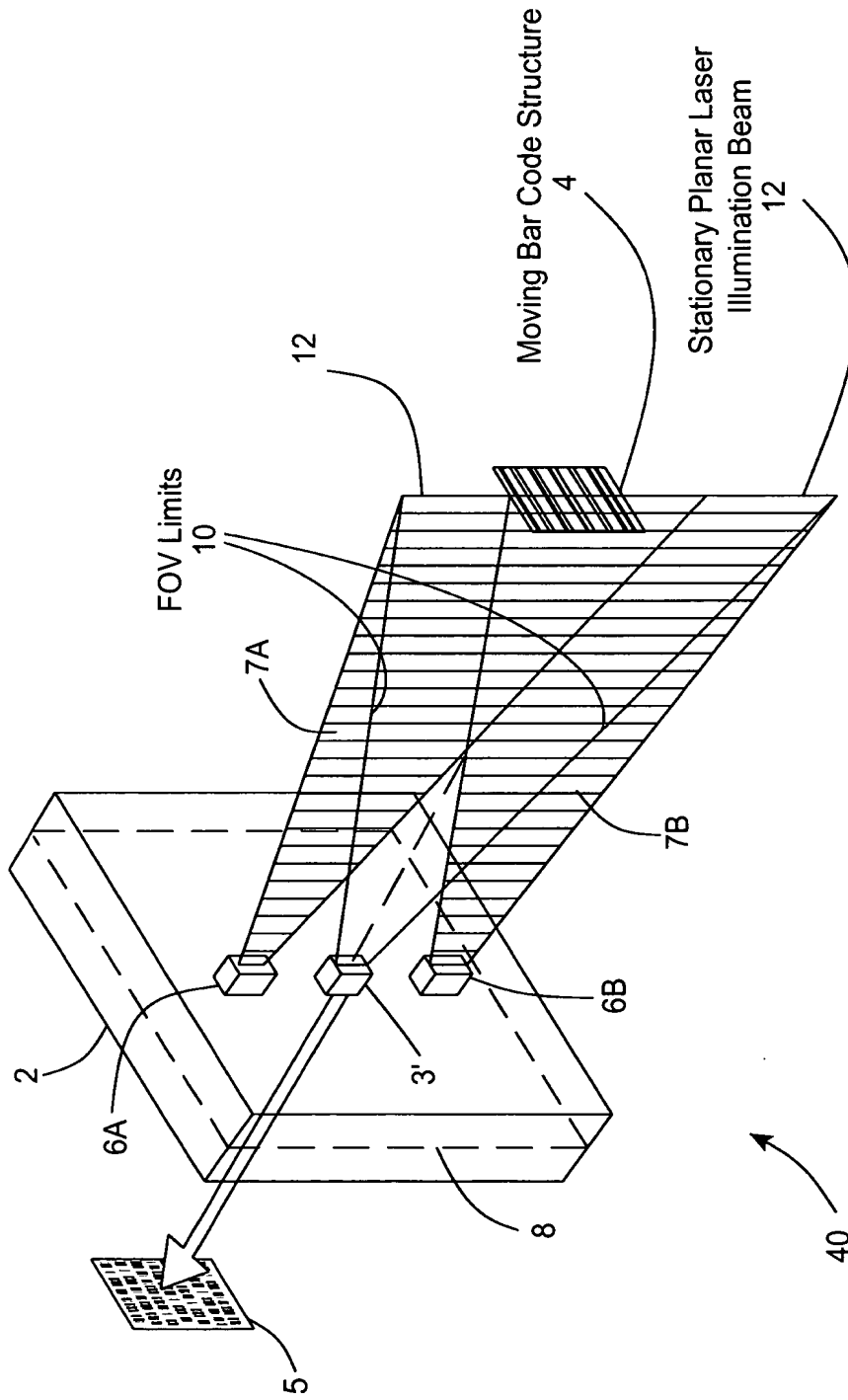


FIG. 2A

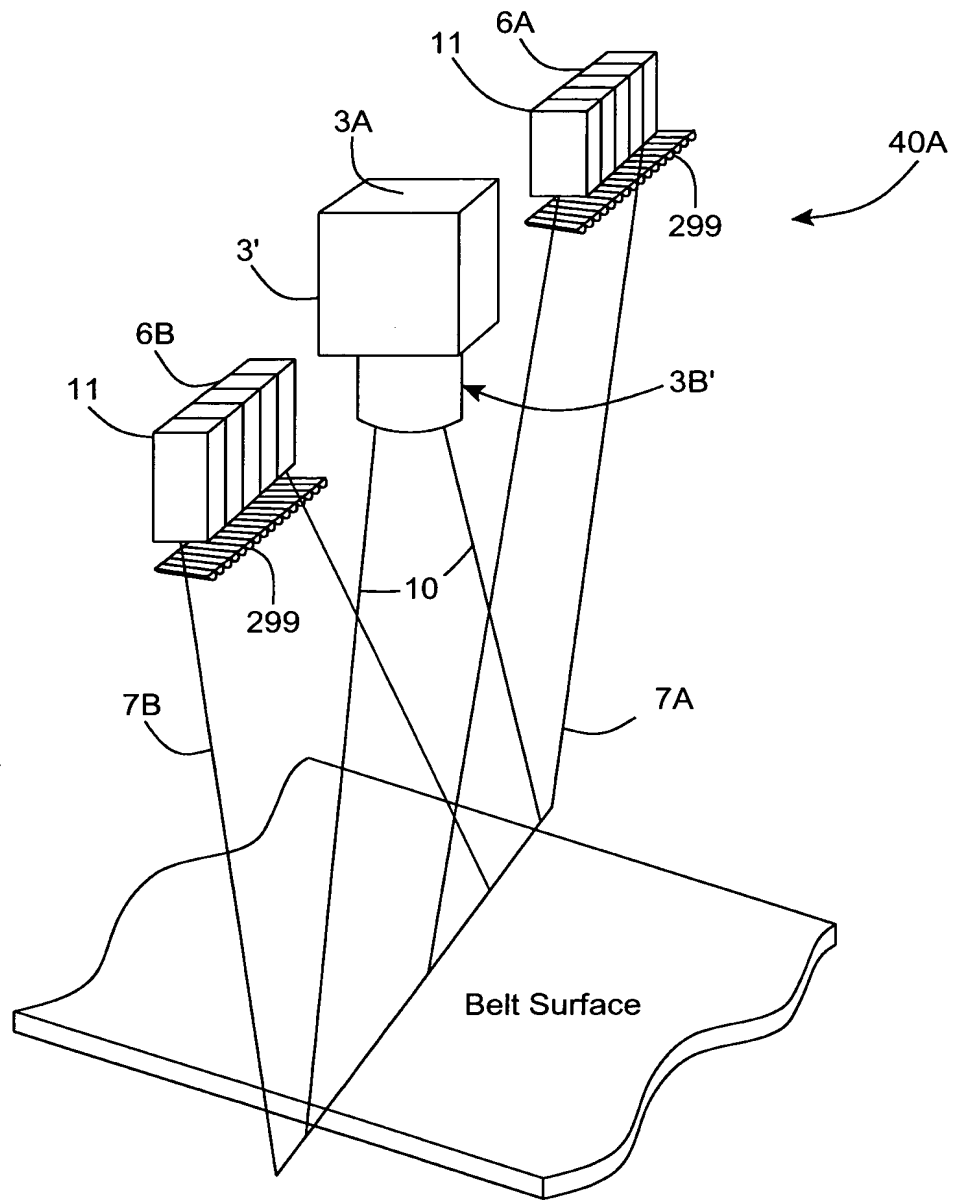


FIG. 2B1

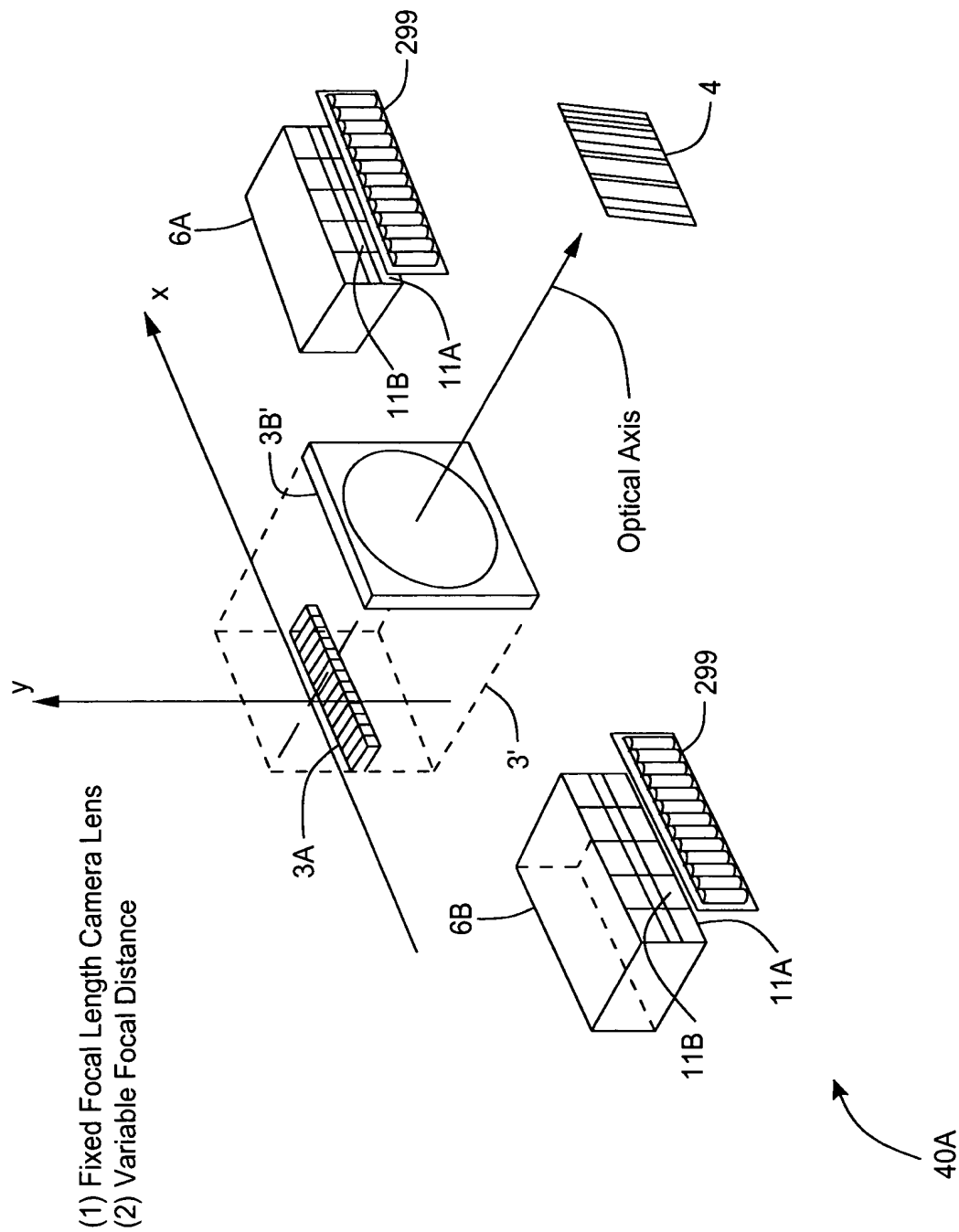


FIG. 2B2

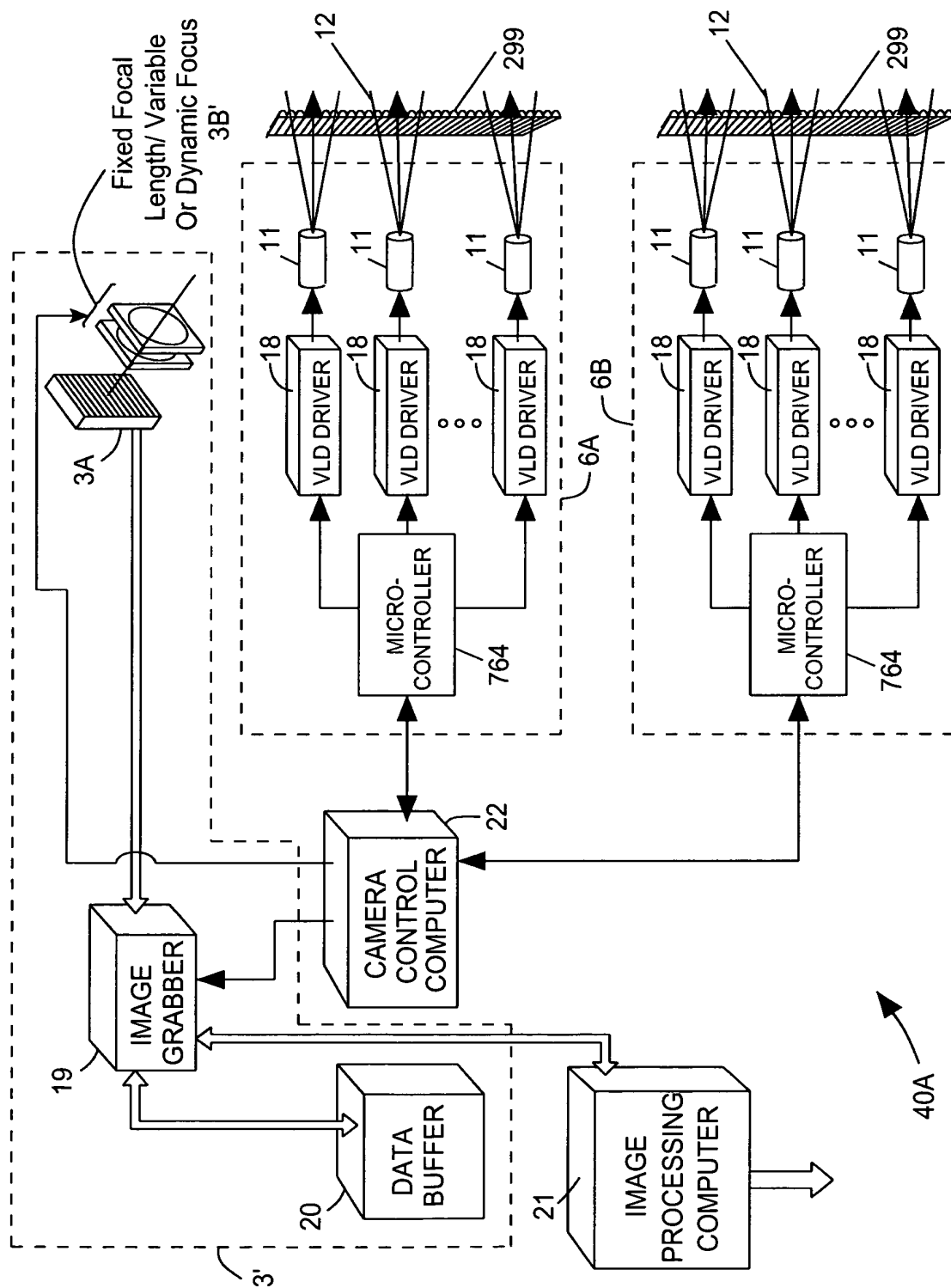


FIG. 2C1

- Fixed Focal Length Imaging Lens
- Variable Or Dynamic Focus Control

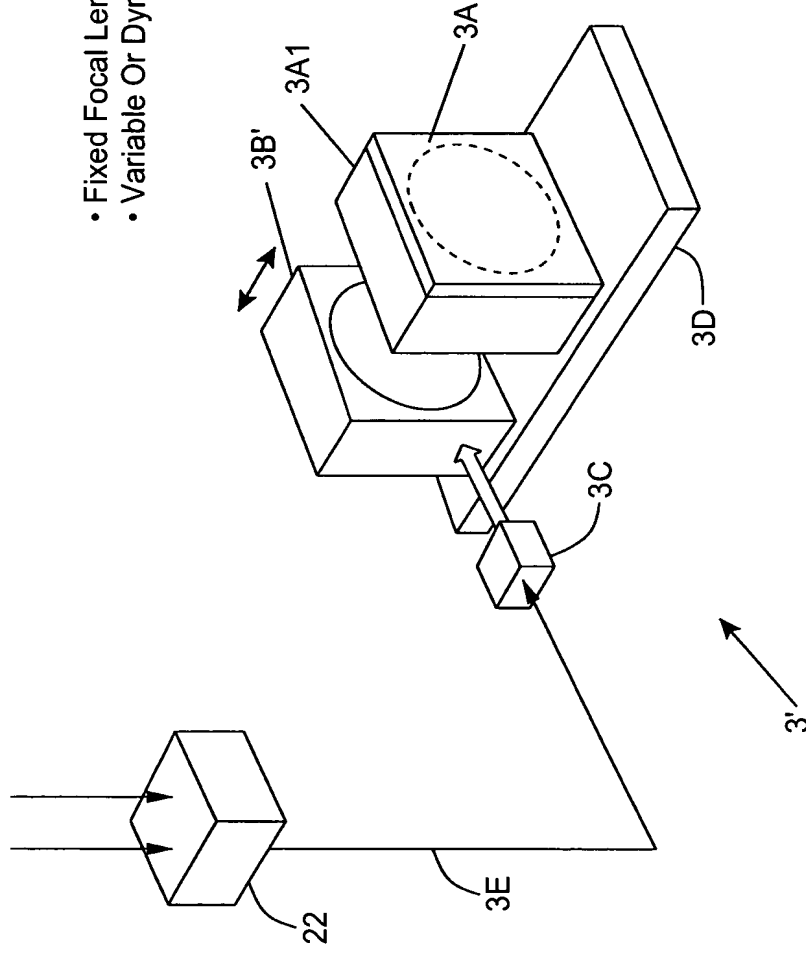


FIG. 2C2

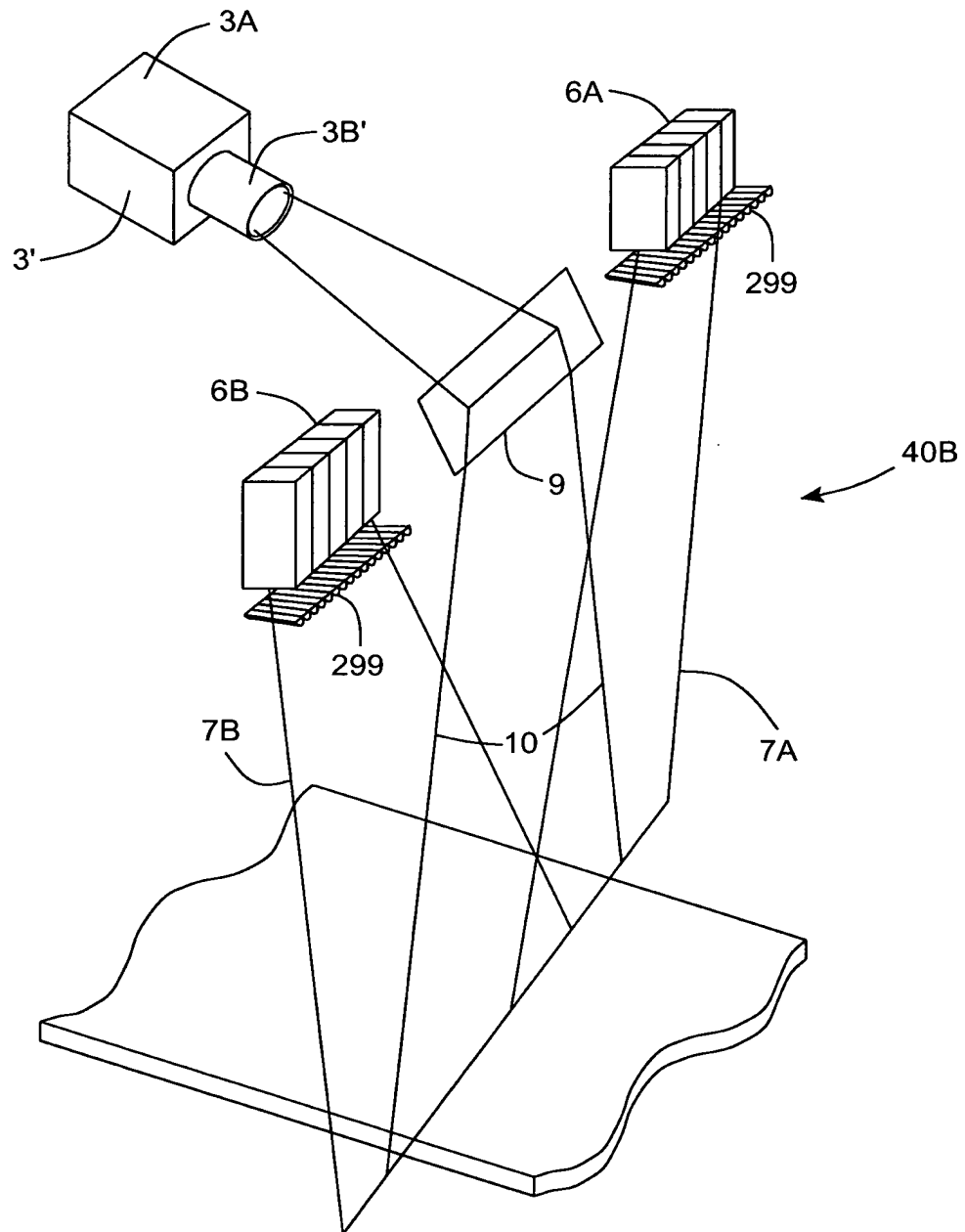


FIG. 2D1

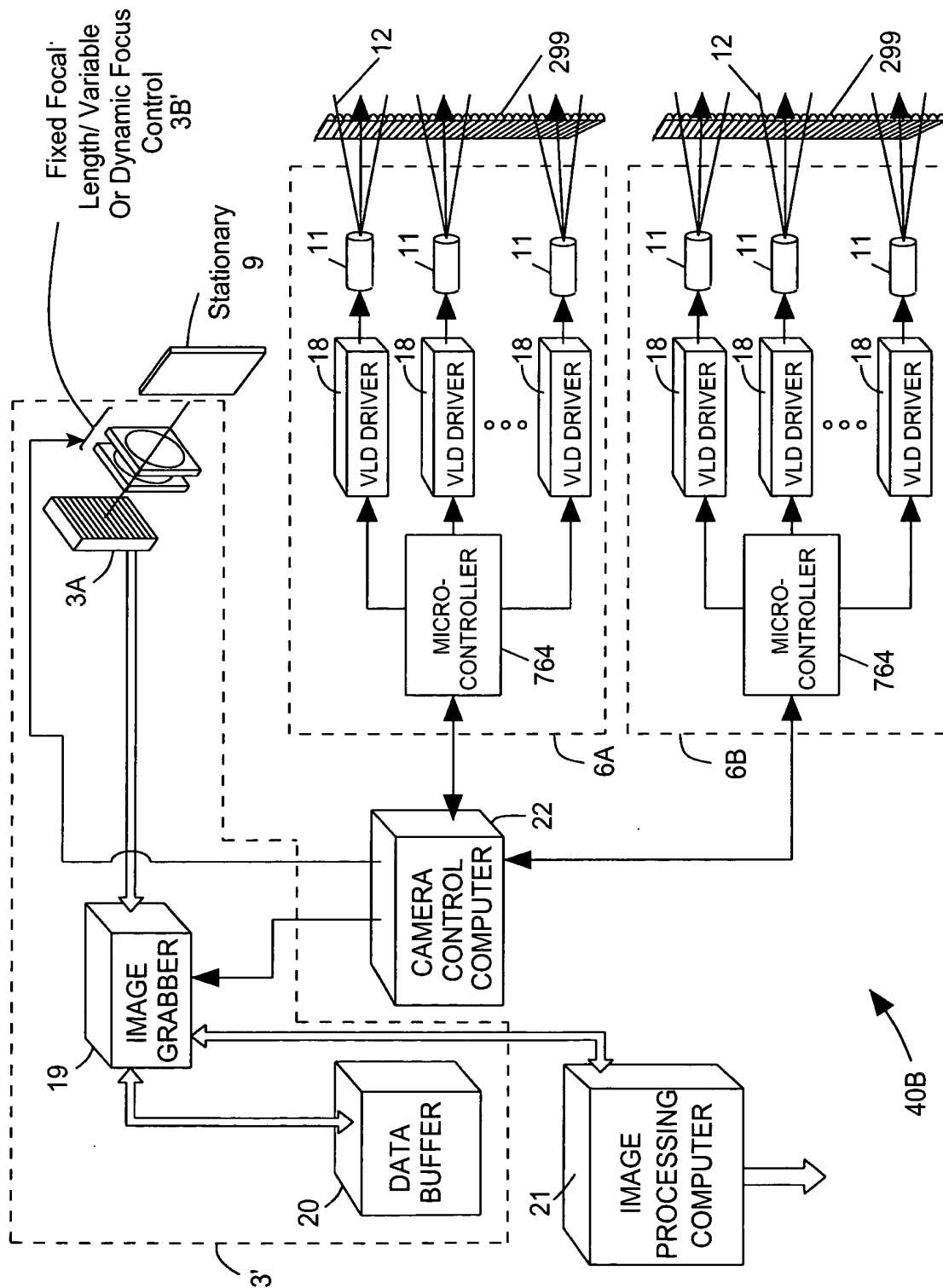


FIG. 2D2

- Fixed Focal Length Imaging Lens
- Variable Or Dynamic Focus Control

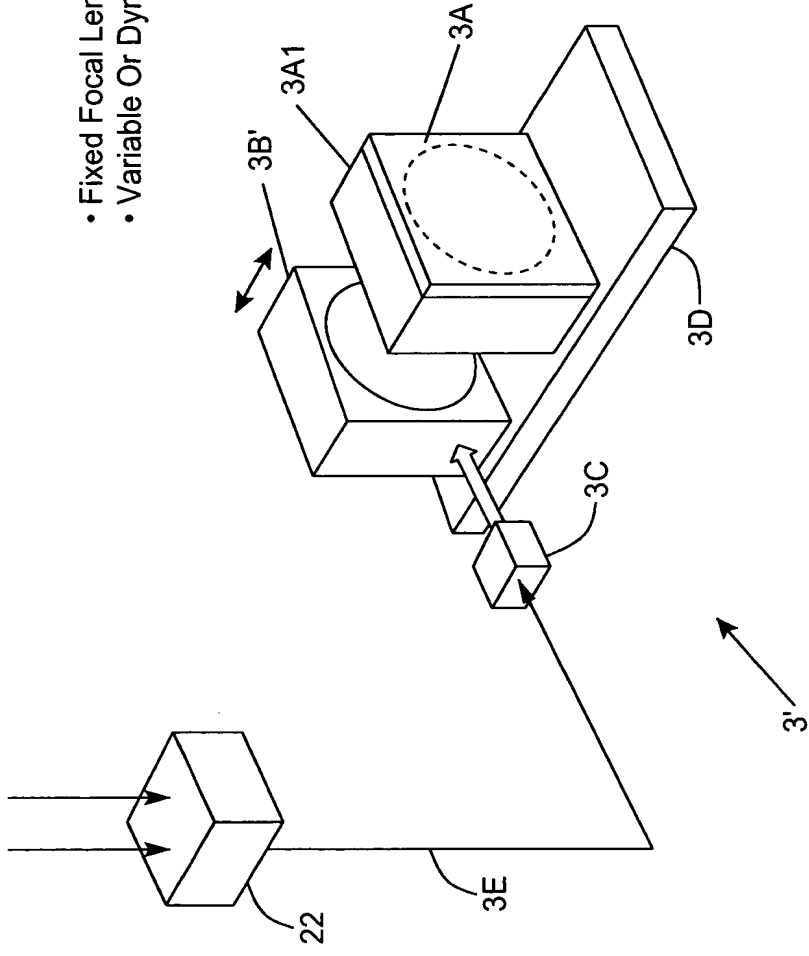


FIG. 2D3

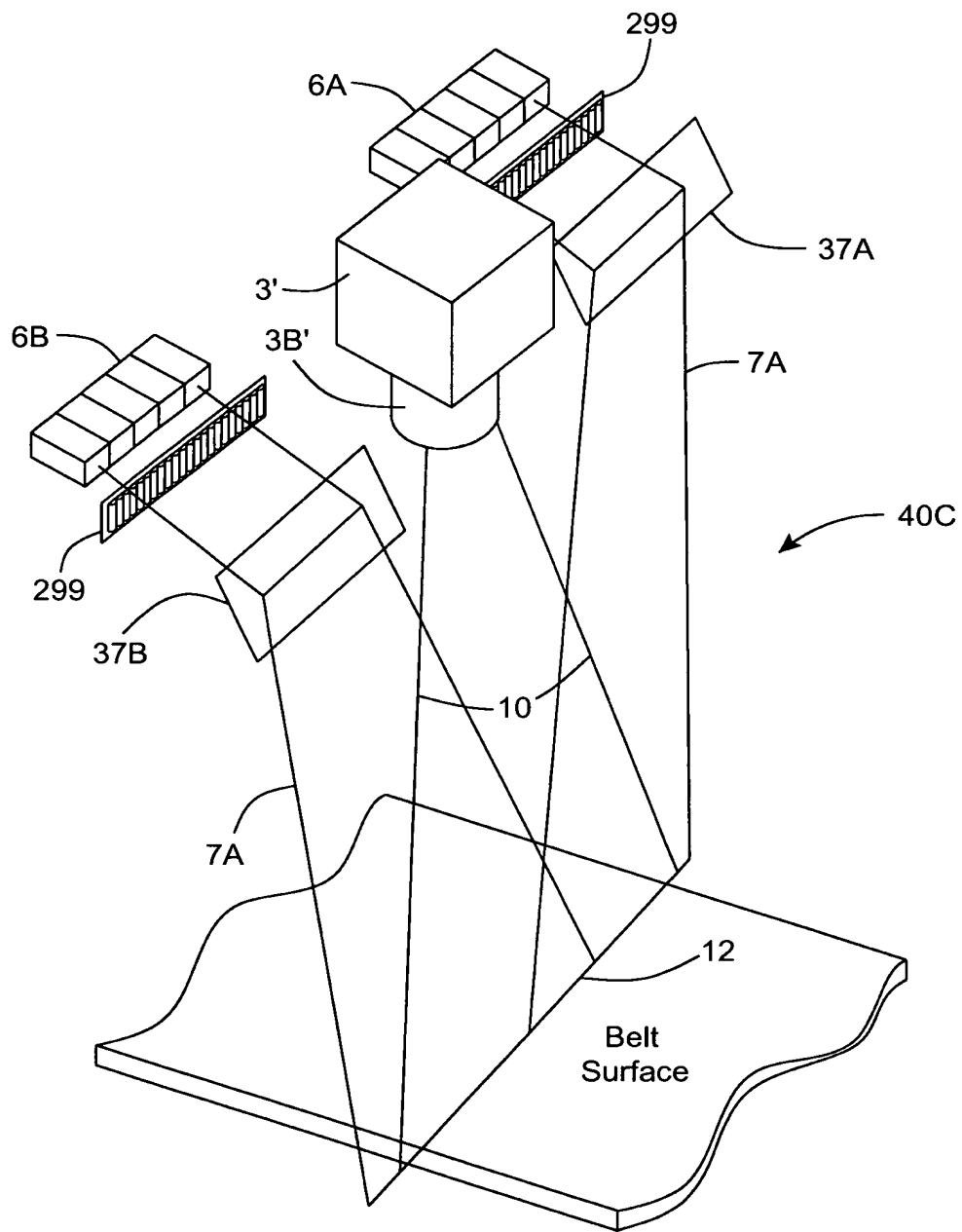


FIG. 2E1

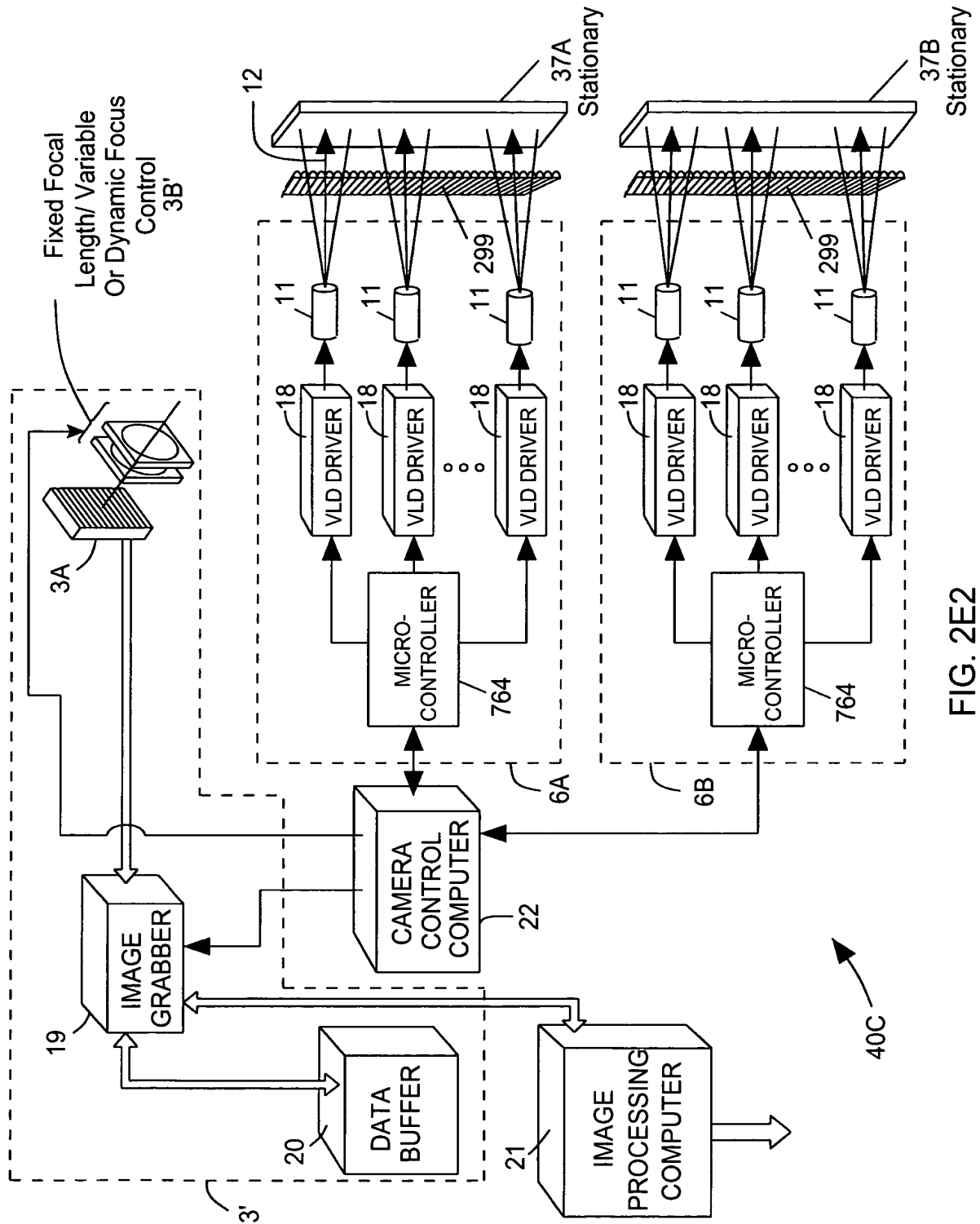


FIG. 2E2

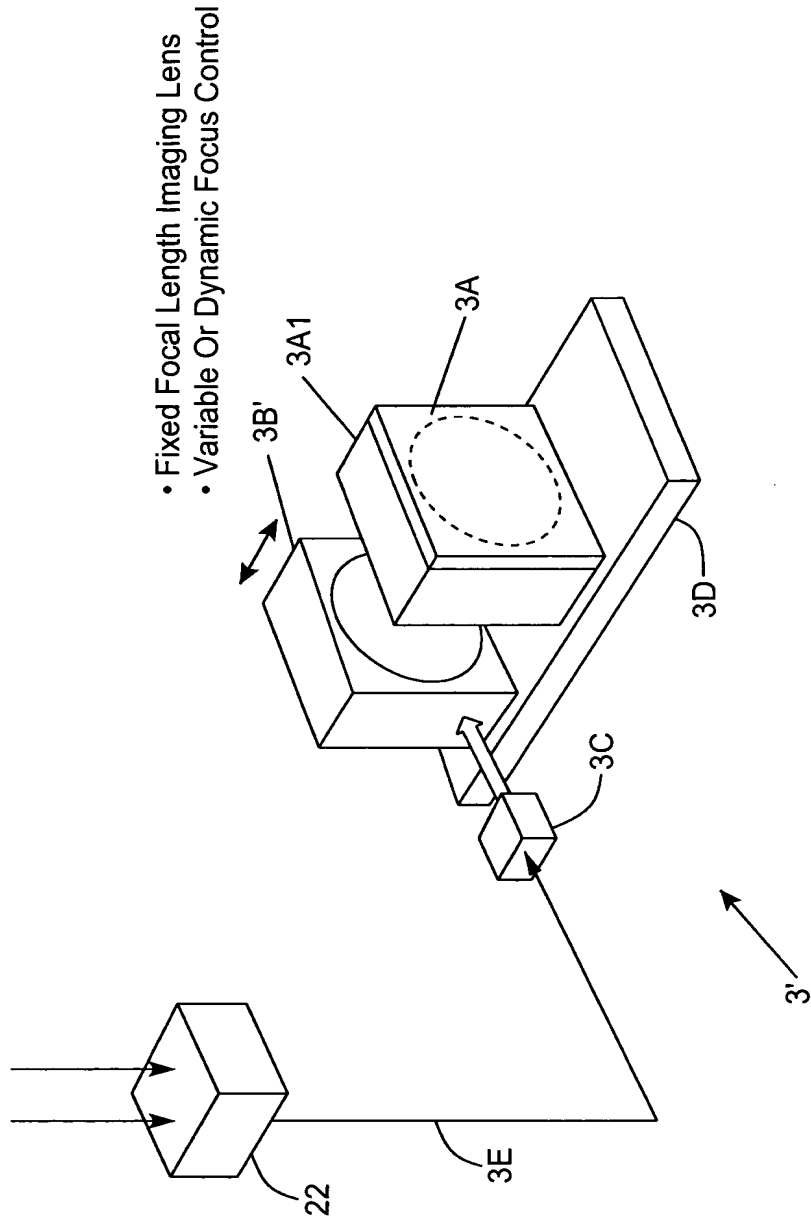


FIG. 2E3

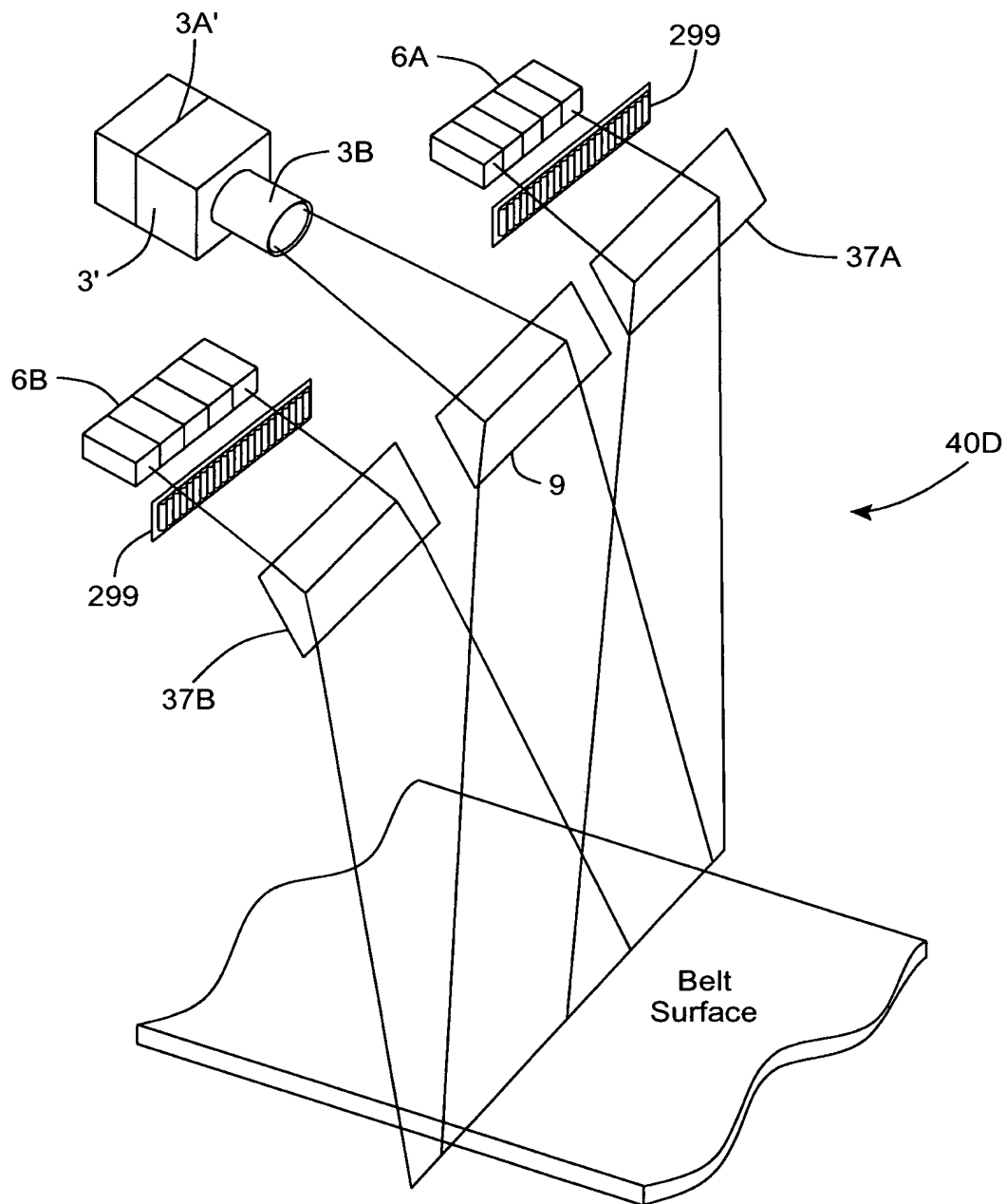


FIG. 2F1

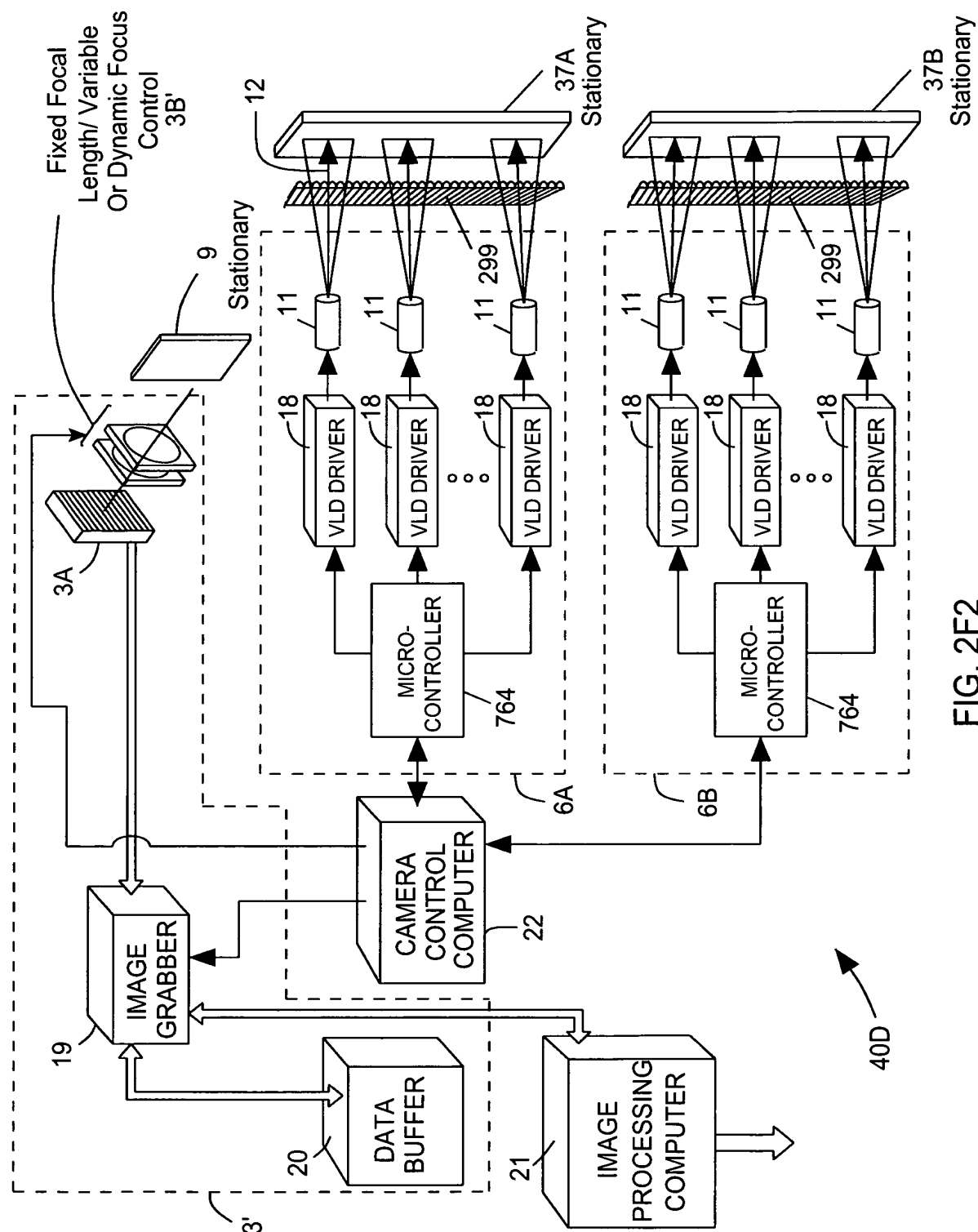


FIG. 2F2

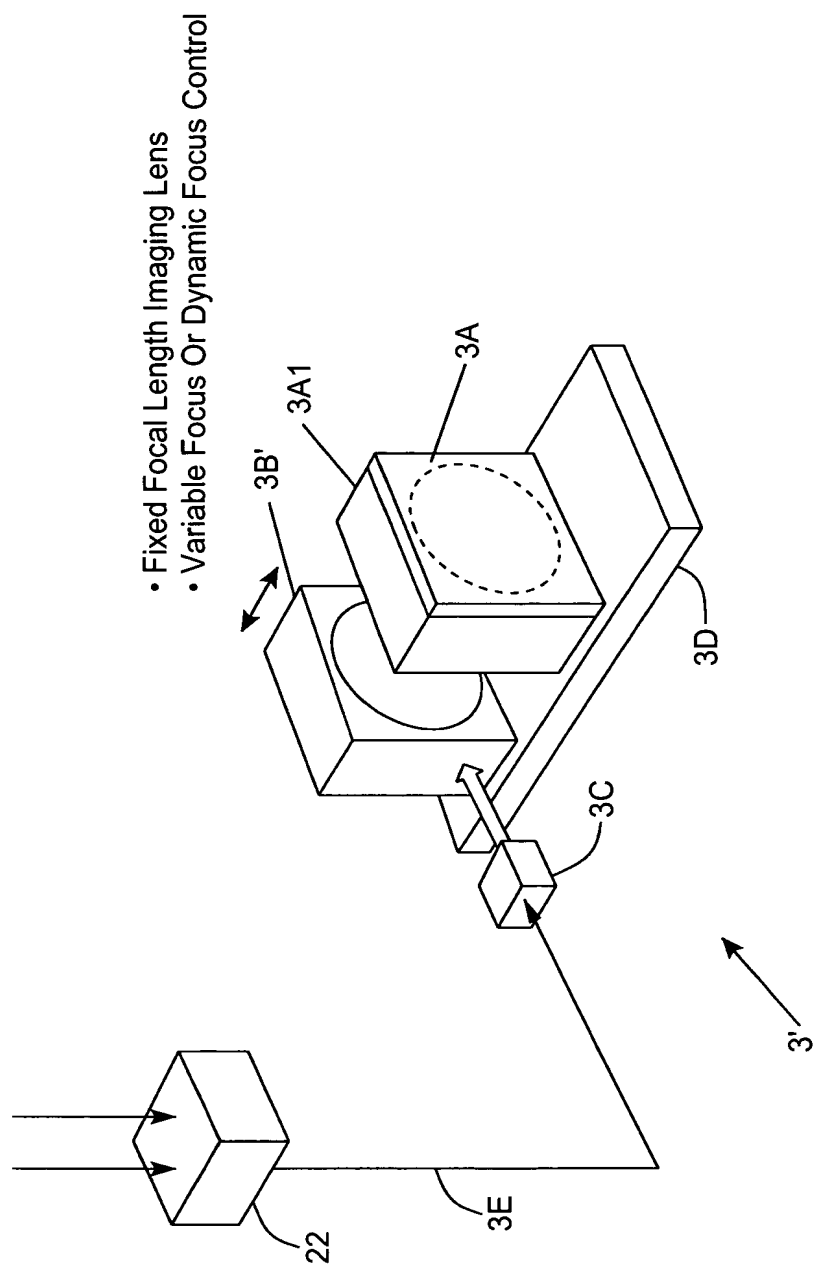


FIG. 2F3



Top Conveyor Scanner:

- Fixed Focal Length Imaging Lens
- Variable Focal Distance Control

Side Conveyor Scanner:

- Fixed Focal Length Imaging Lens
- Dynamic Focal Distance Control

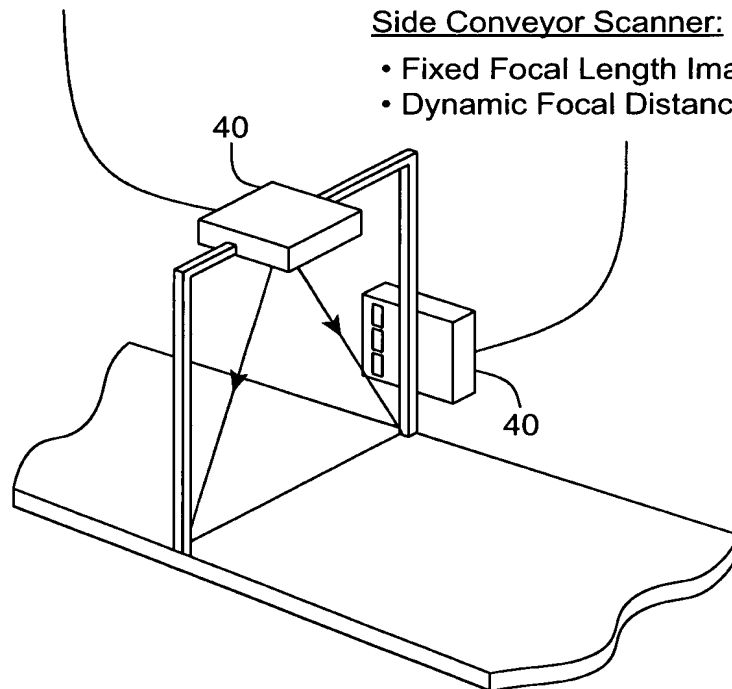
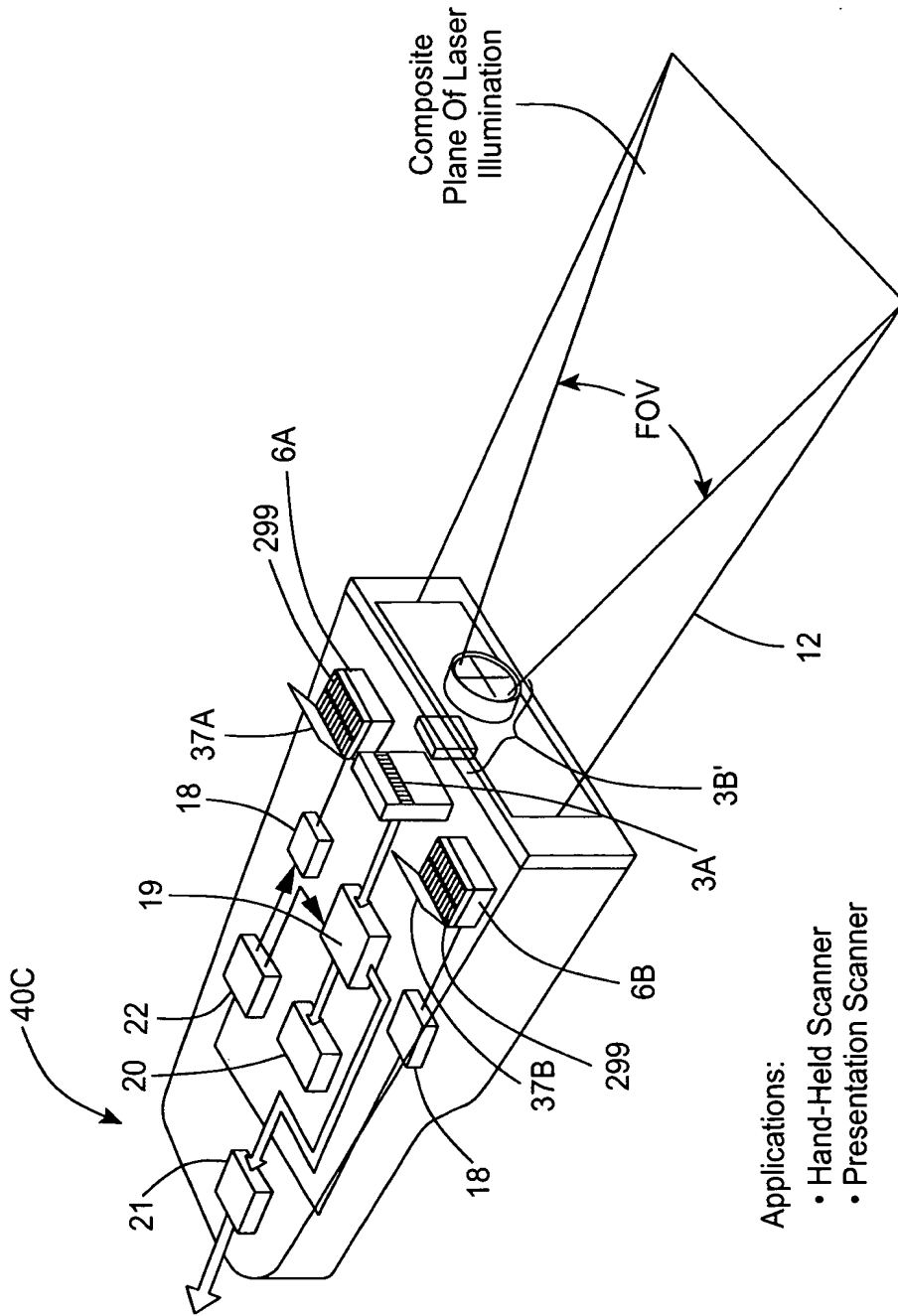


FIG. 2G



Applications:
 • Hand-Held Scanner
 • Presentation Scanner

FIG. 2H

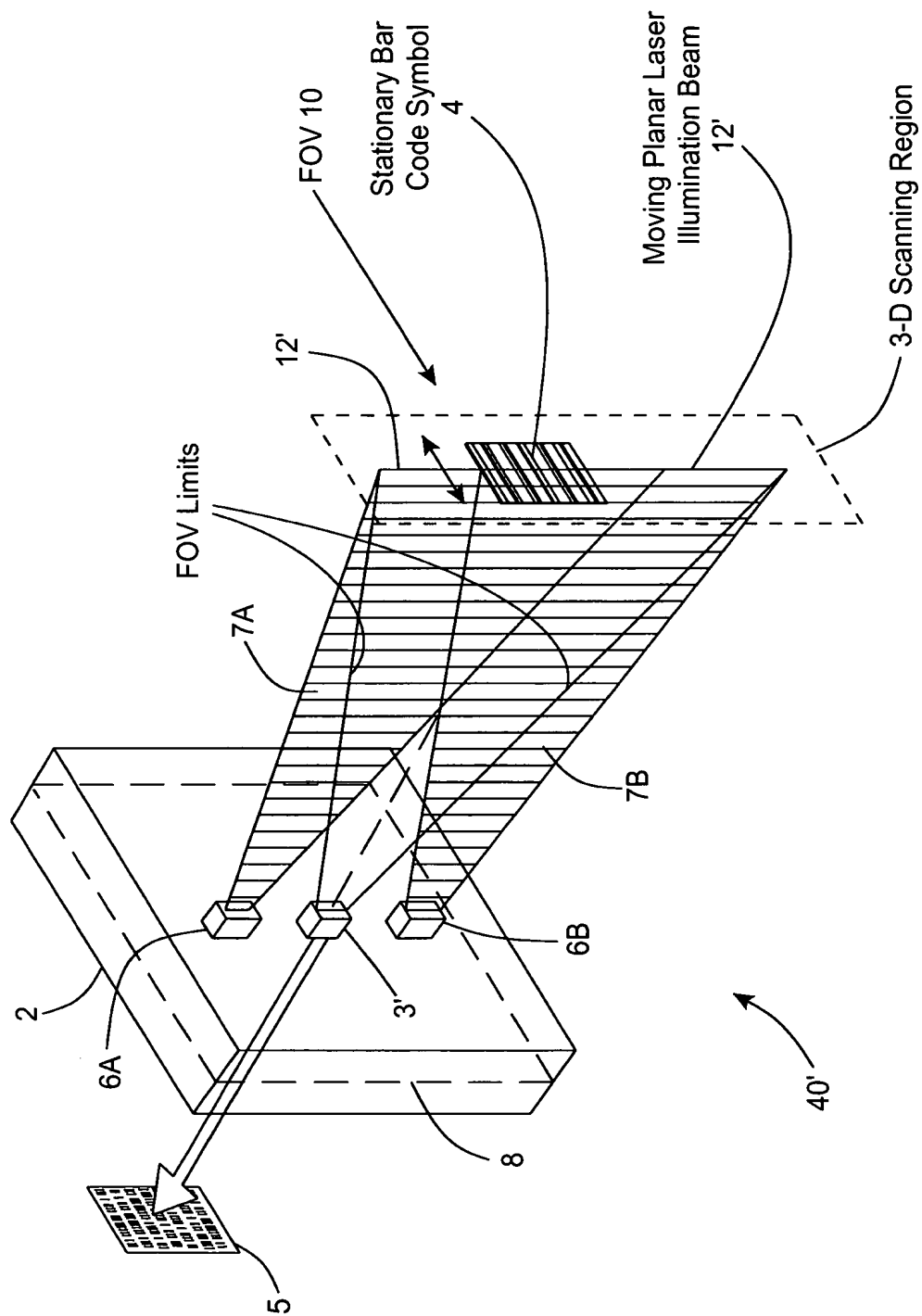


FIG. 211

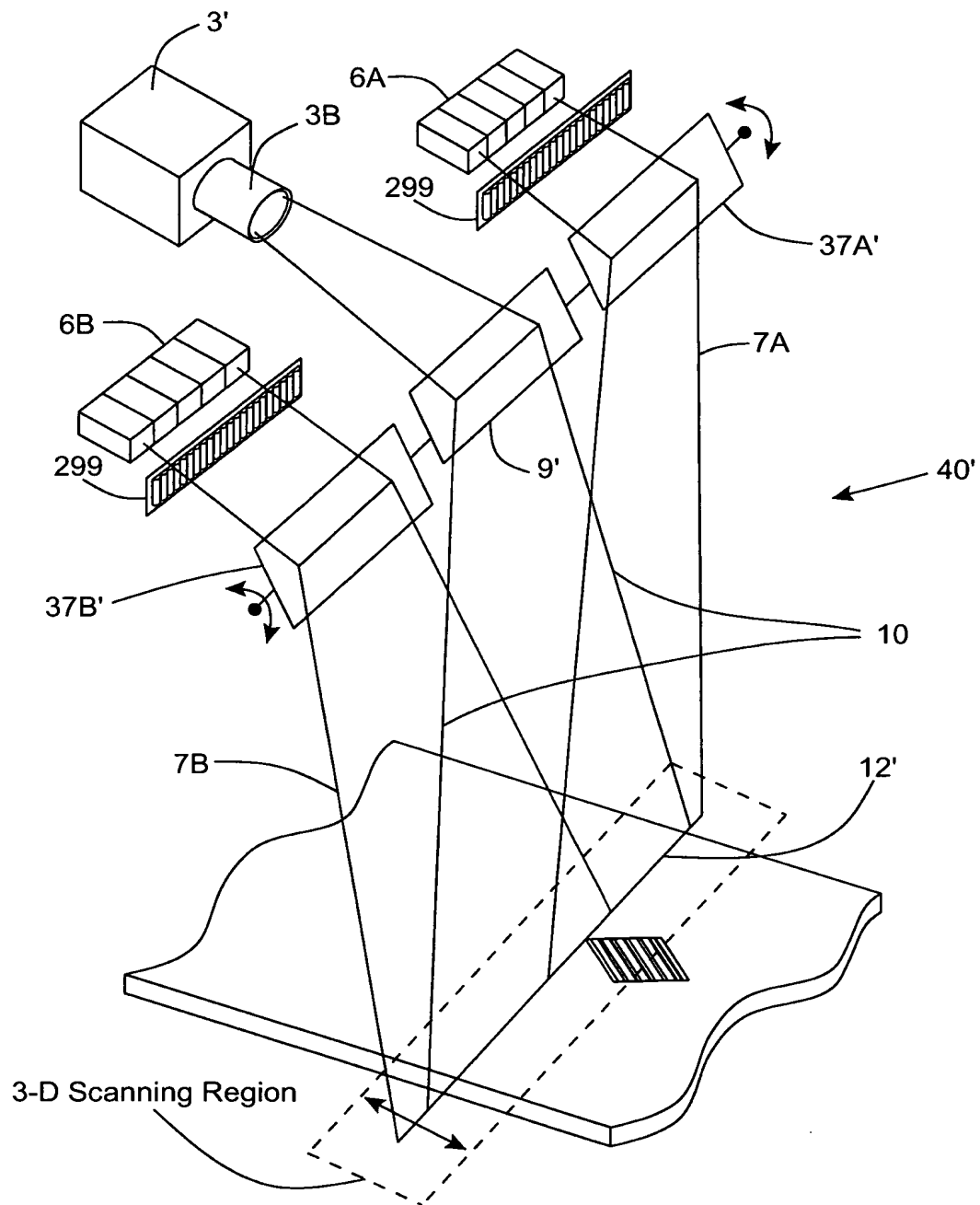


FIG. 212

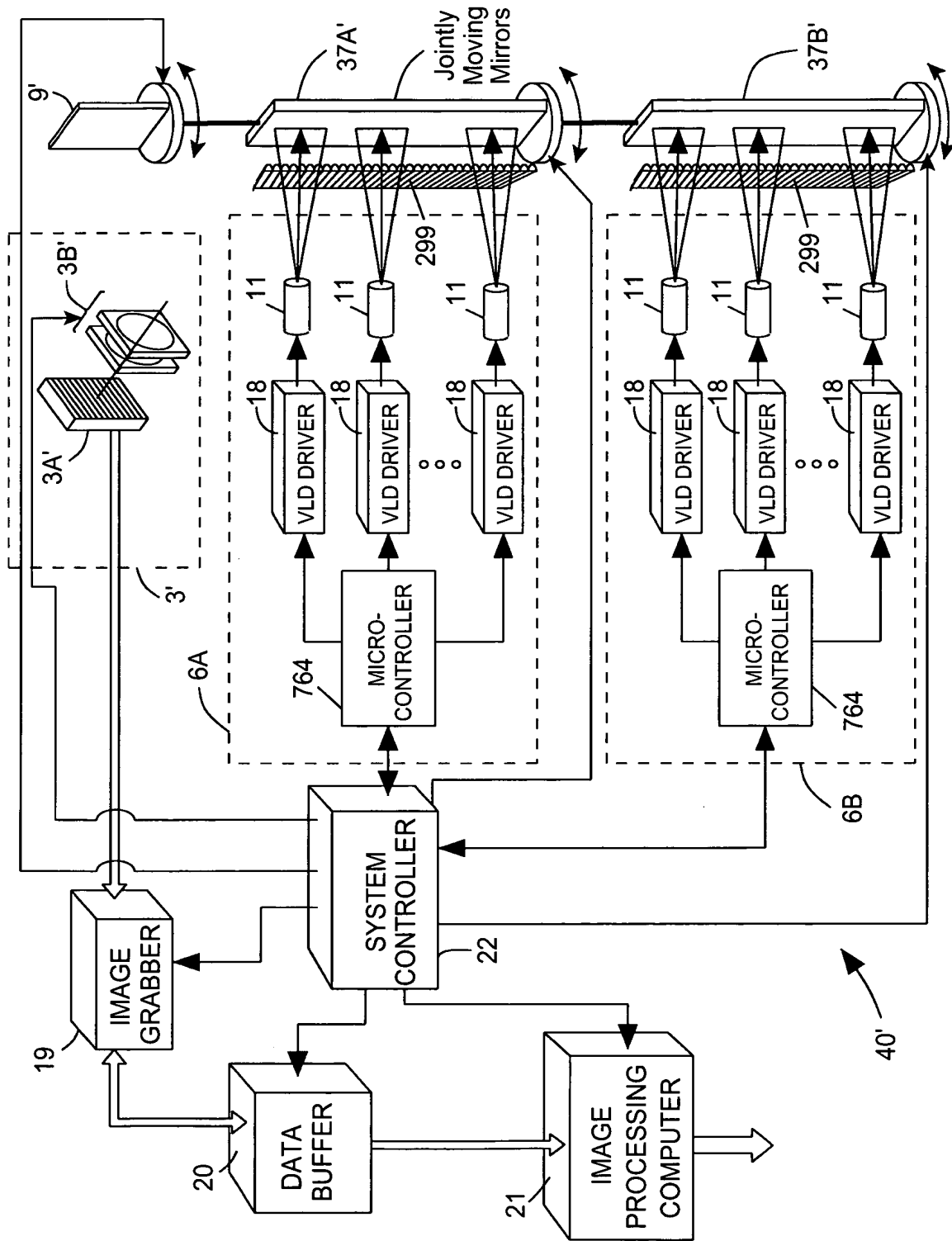


FIG. 213

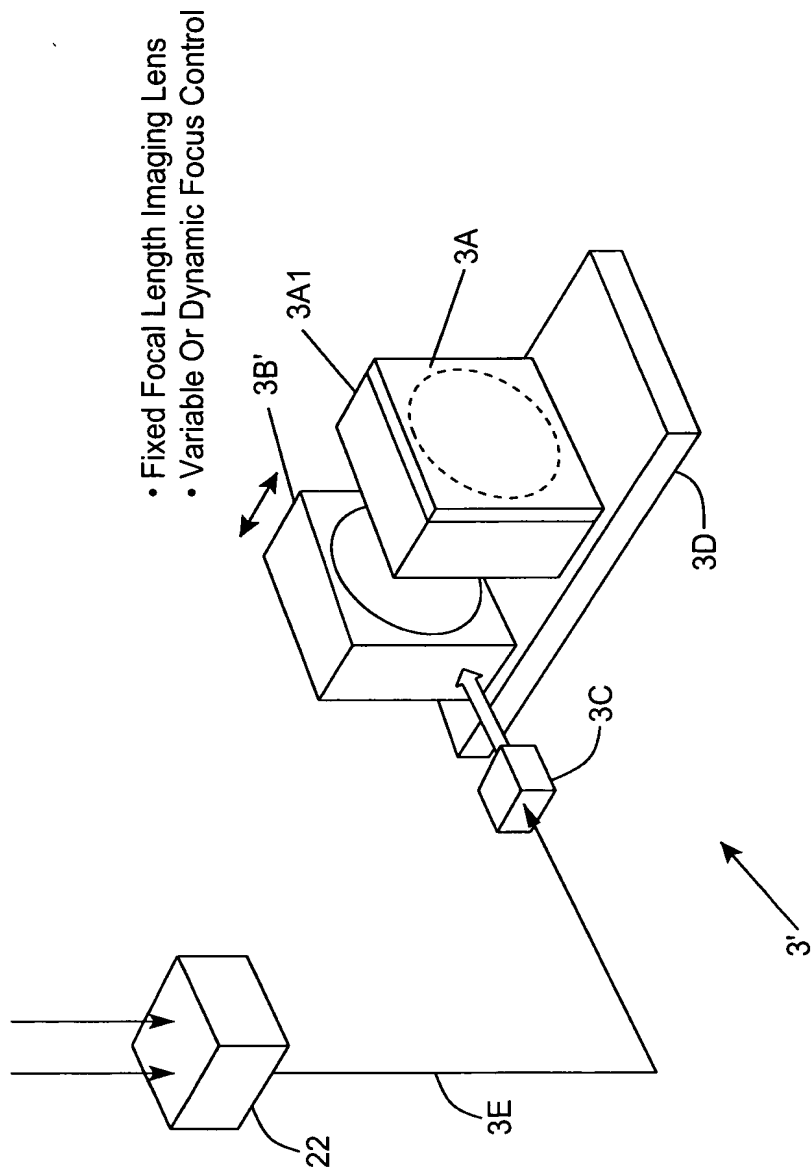


FIG. 2I4

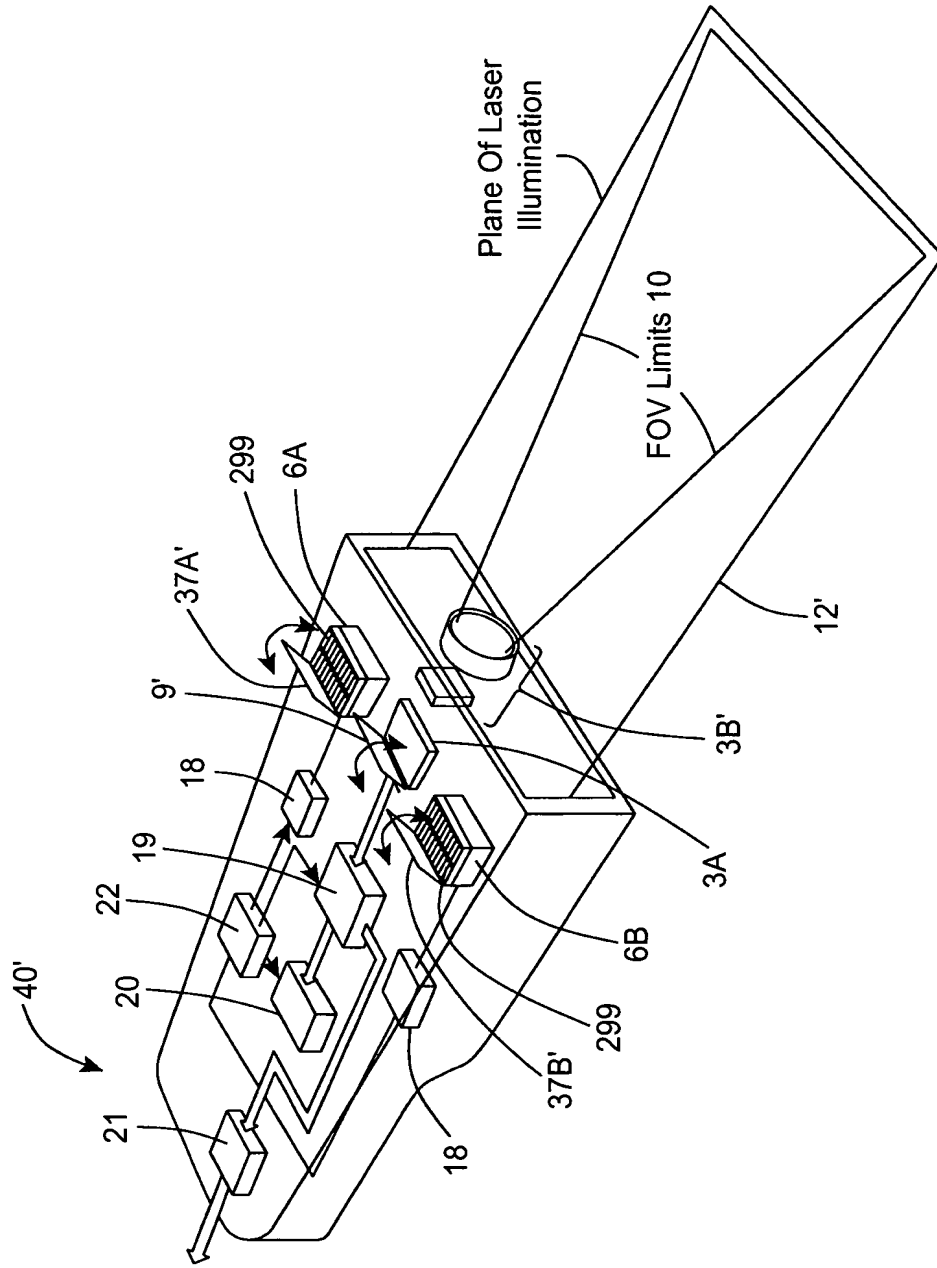


FIG. 215

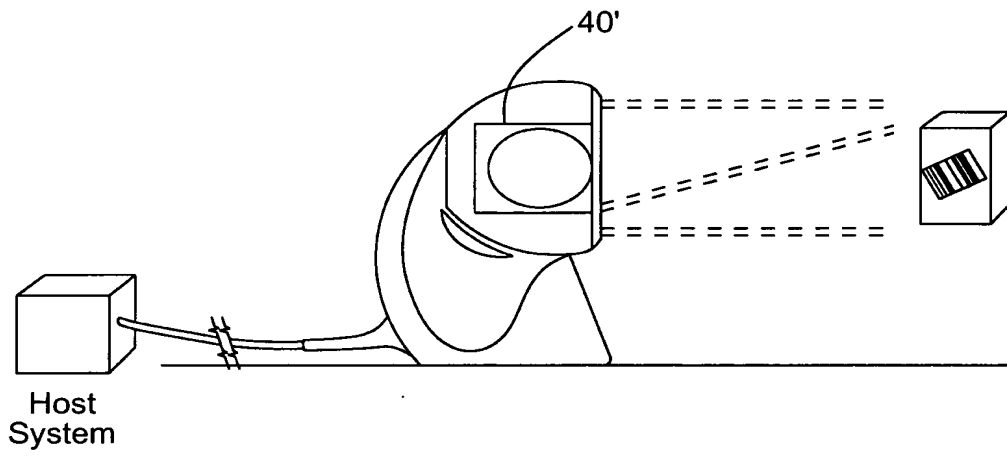


FIG. 216

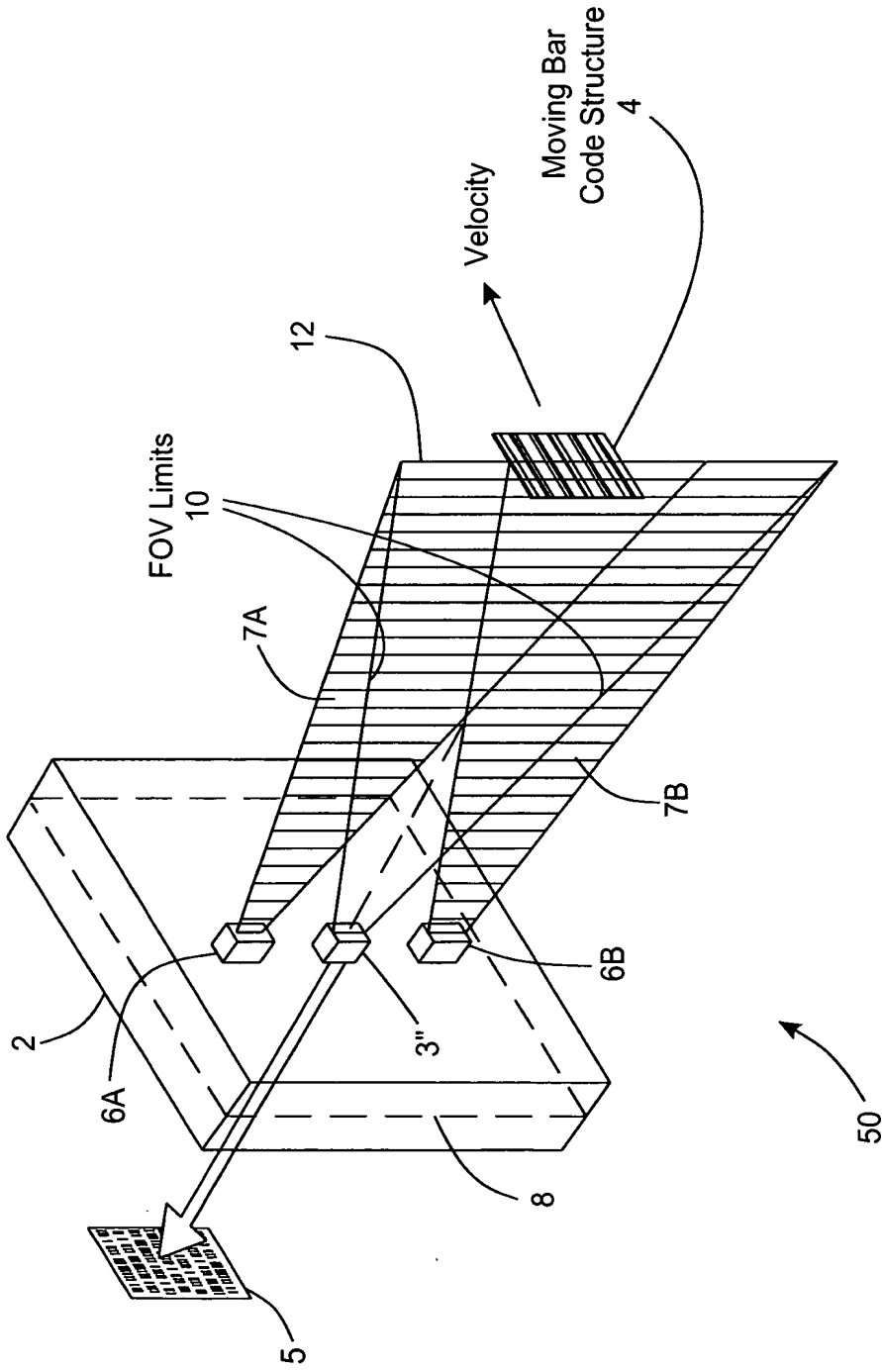


FIG. 3A

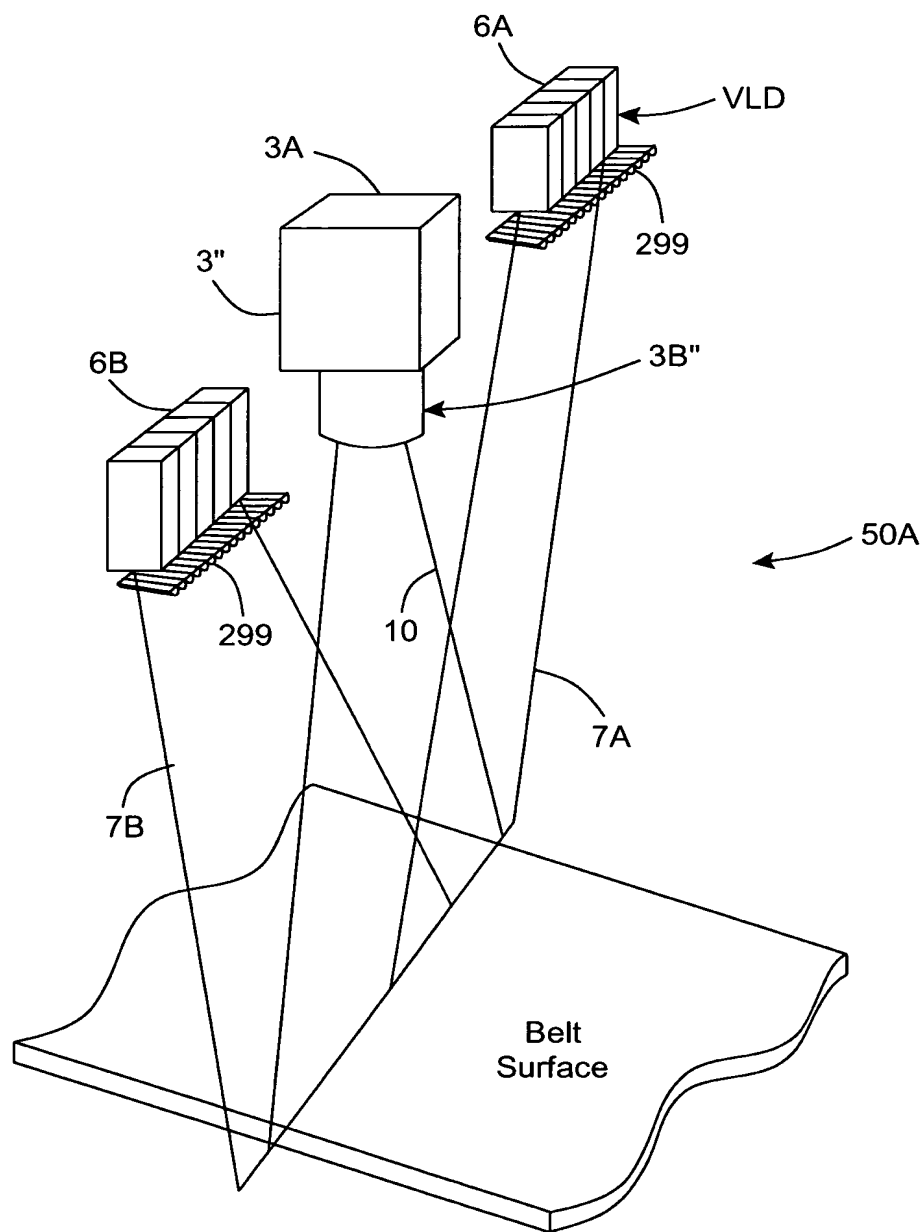


FIG. 3B1

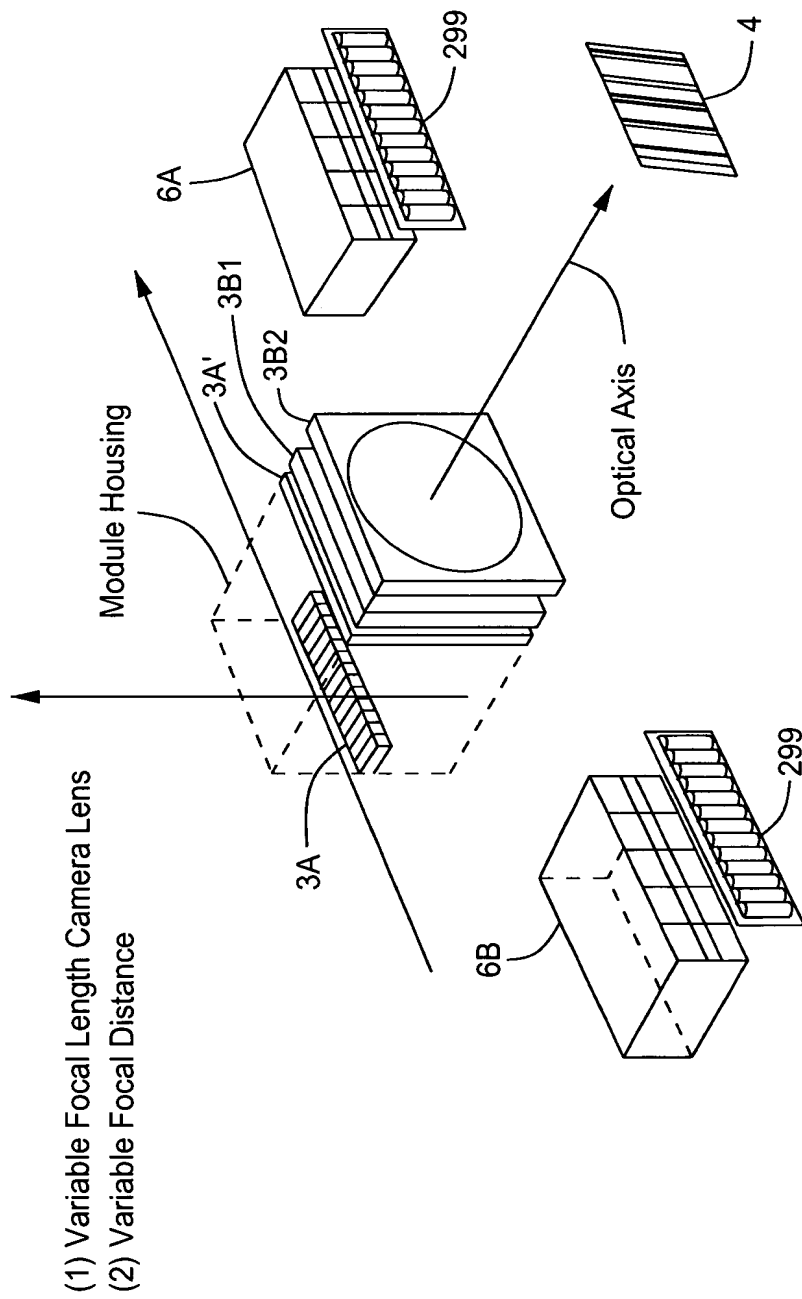


FIG. 3B2

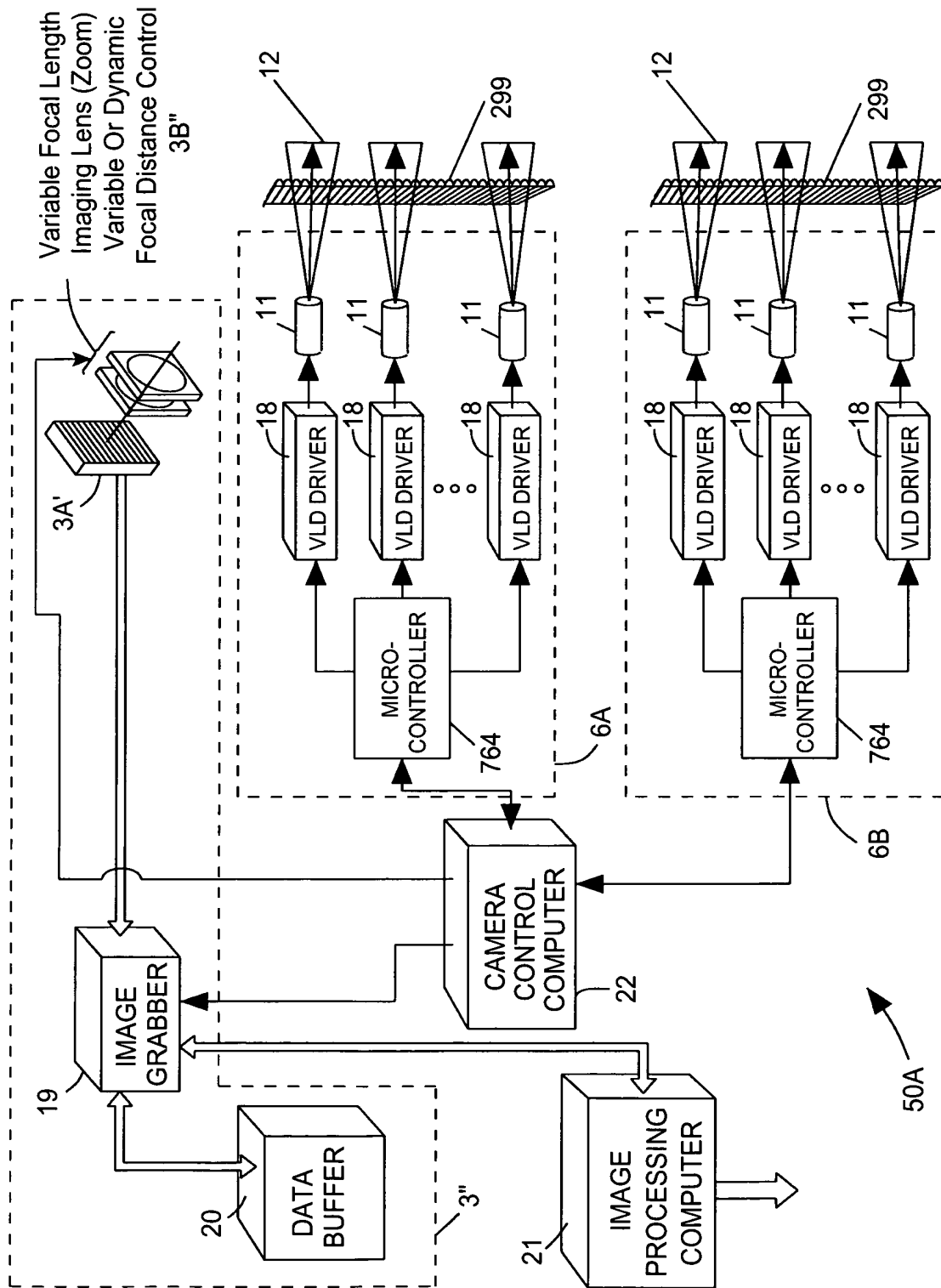
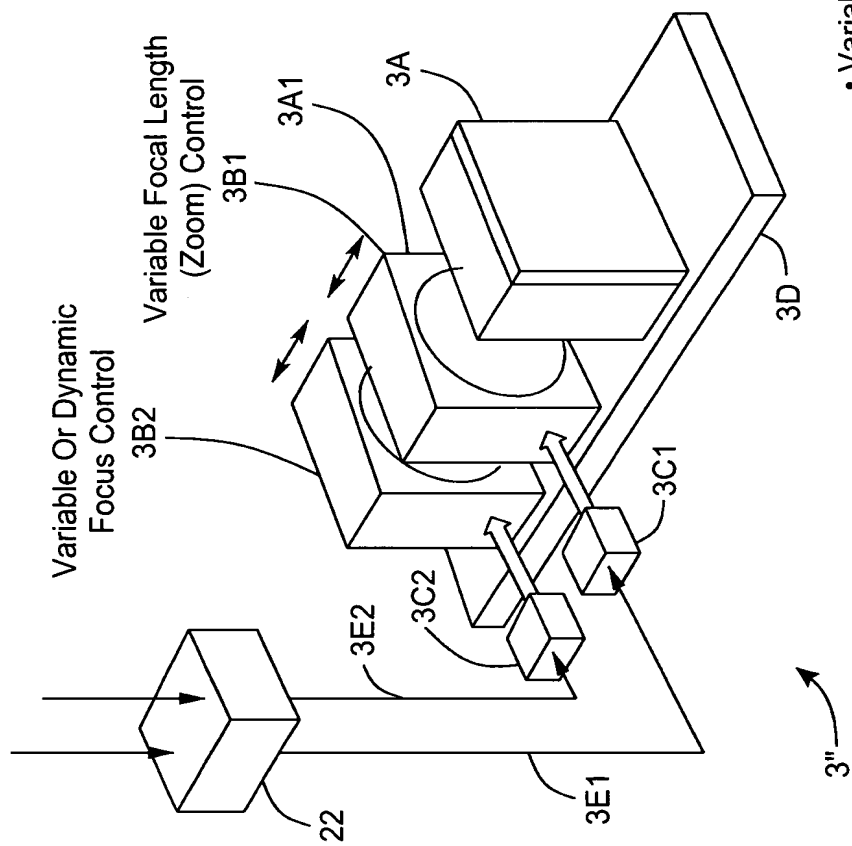


FIG. 3C1



- FIG. 3C2

FIG. 3C2

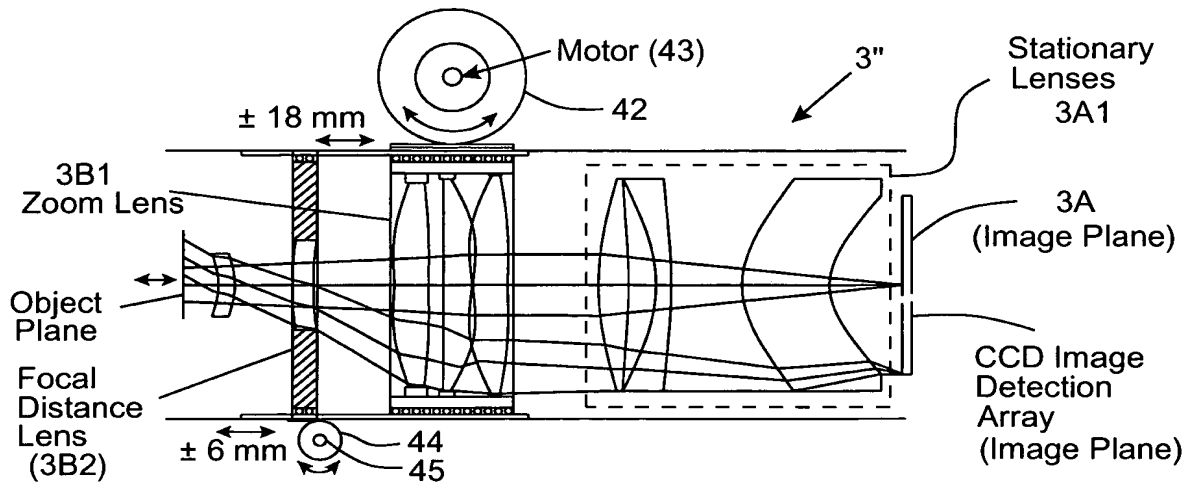


FIG. 3D1

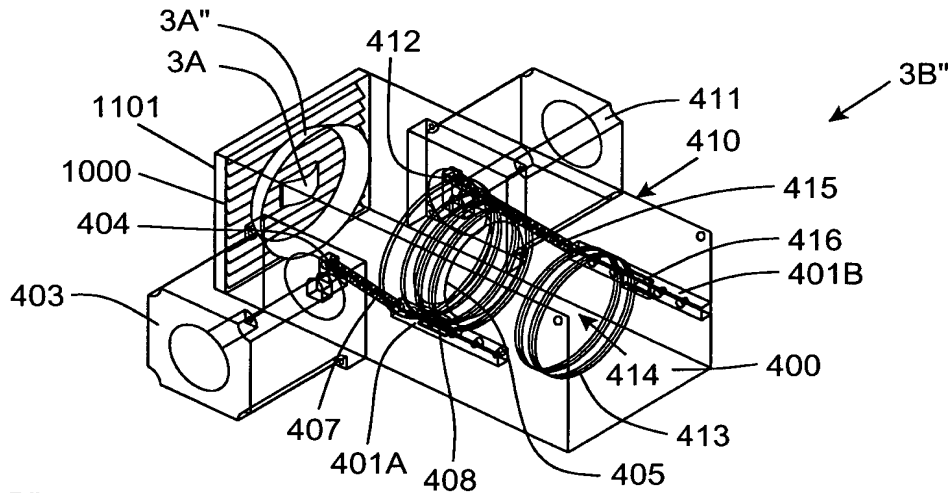


FIG. 3D2

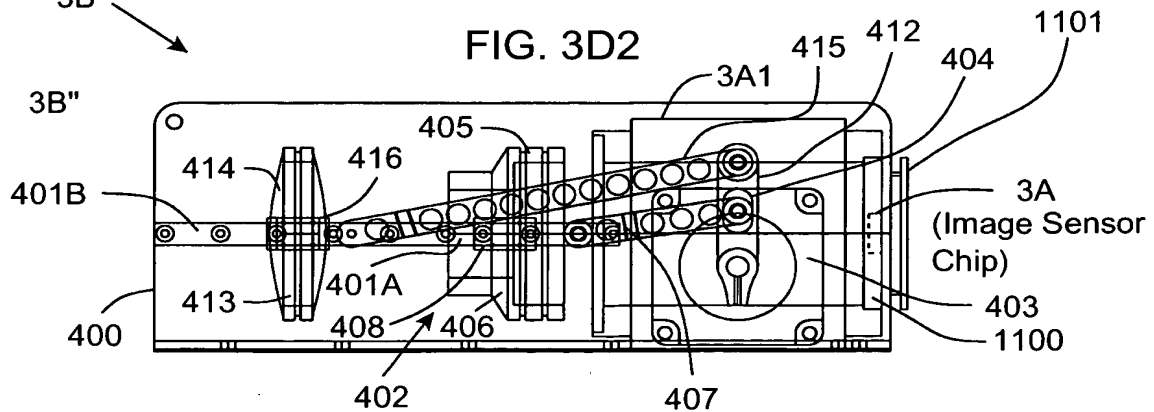


FIG. 3D3

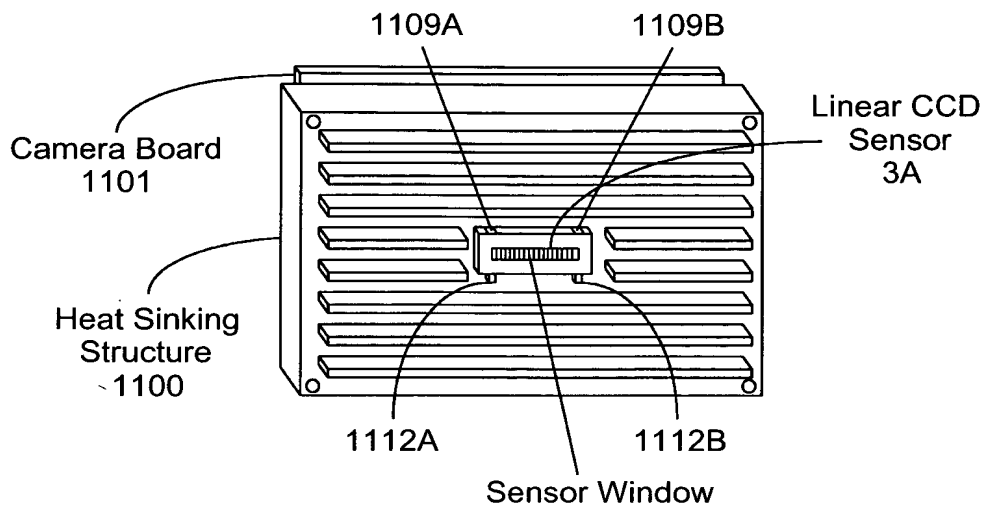


FIG. 3D4

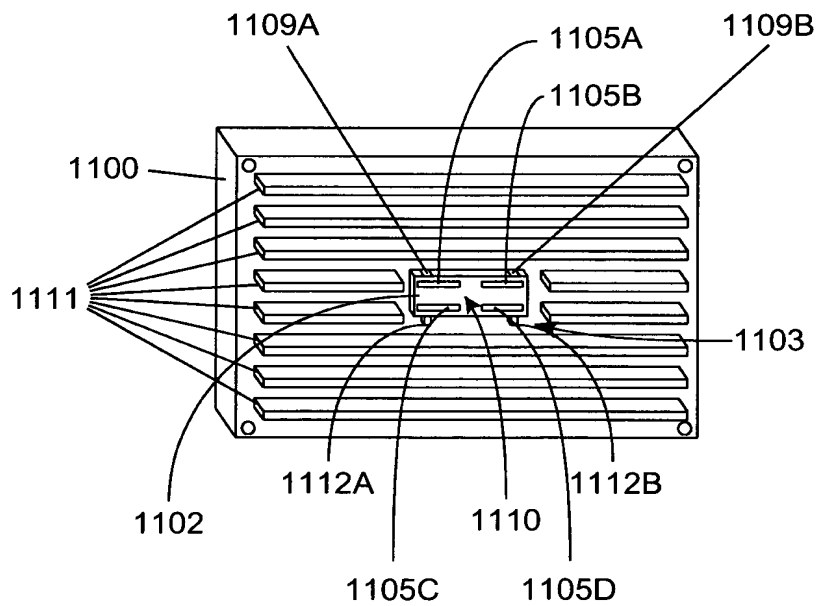


FIG. 3D5

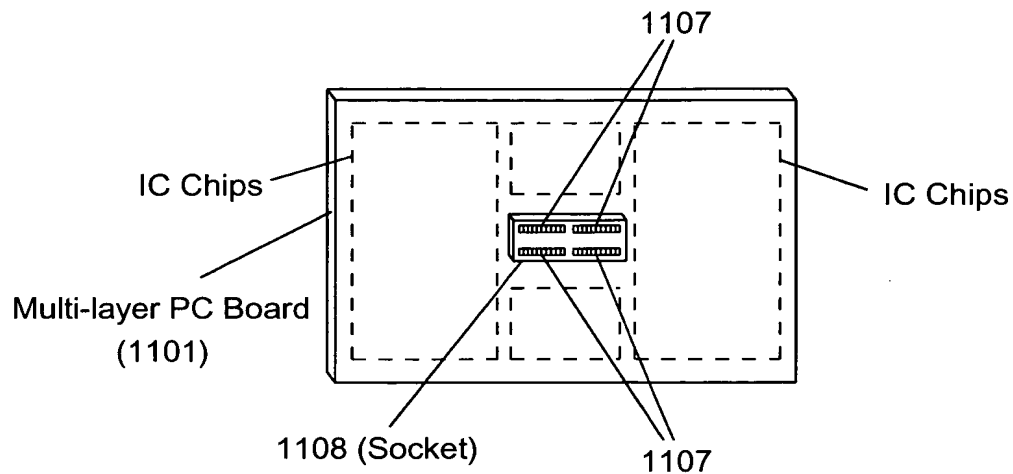


FIG. 3D6

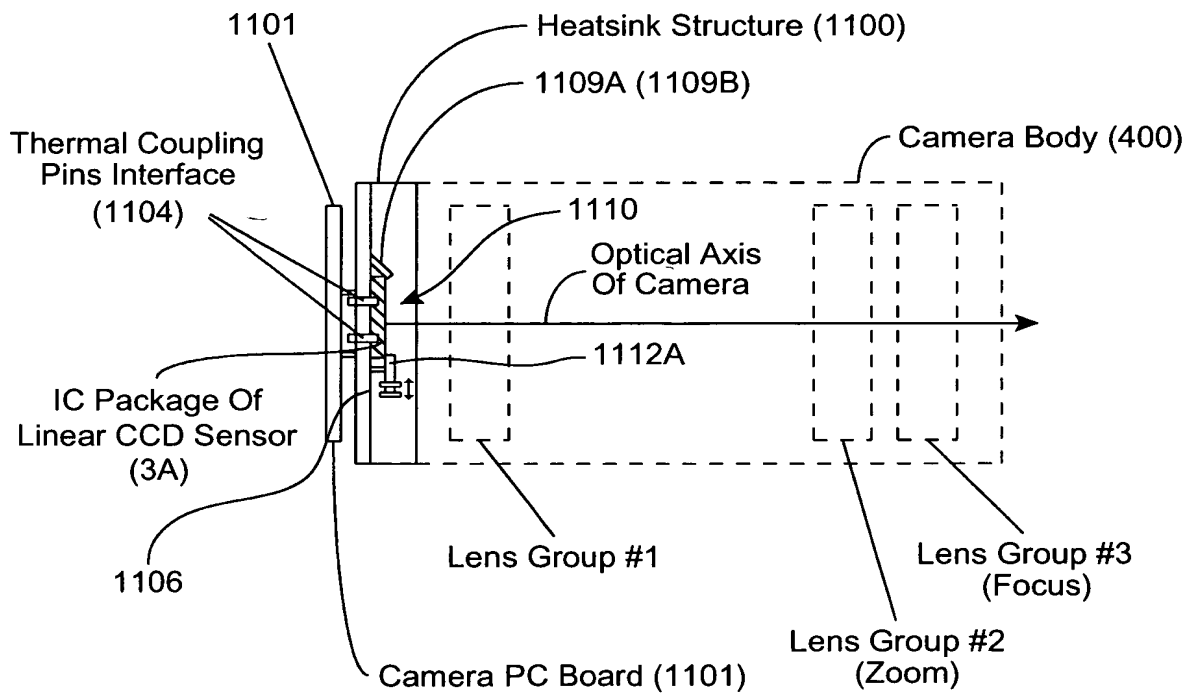


FIG. 3D7

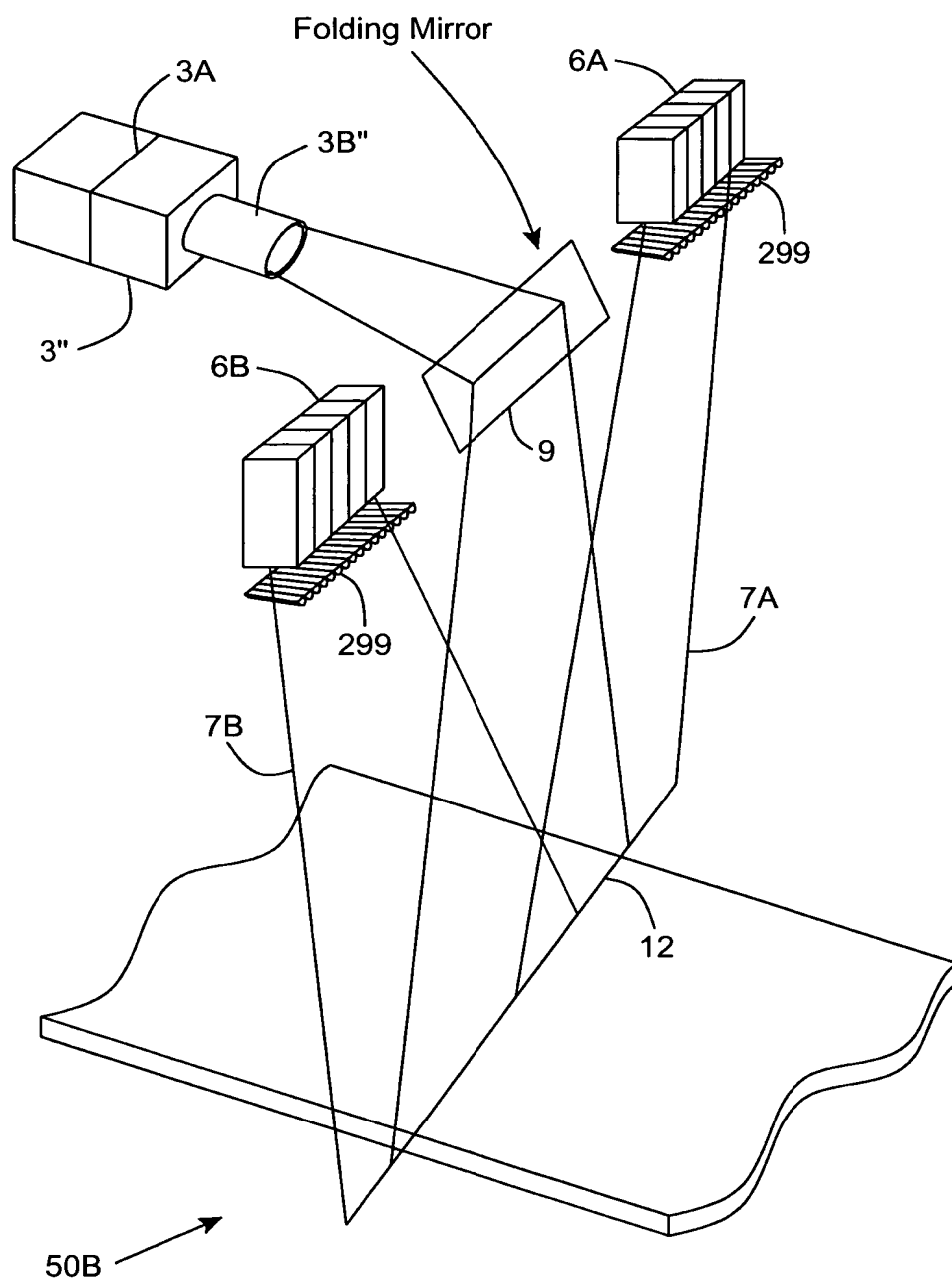


FIG. 3E1

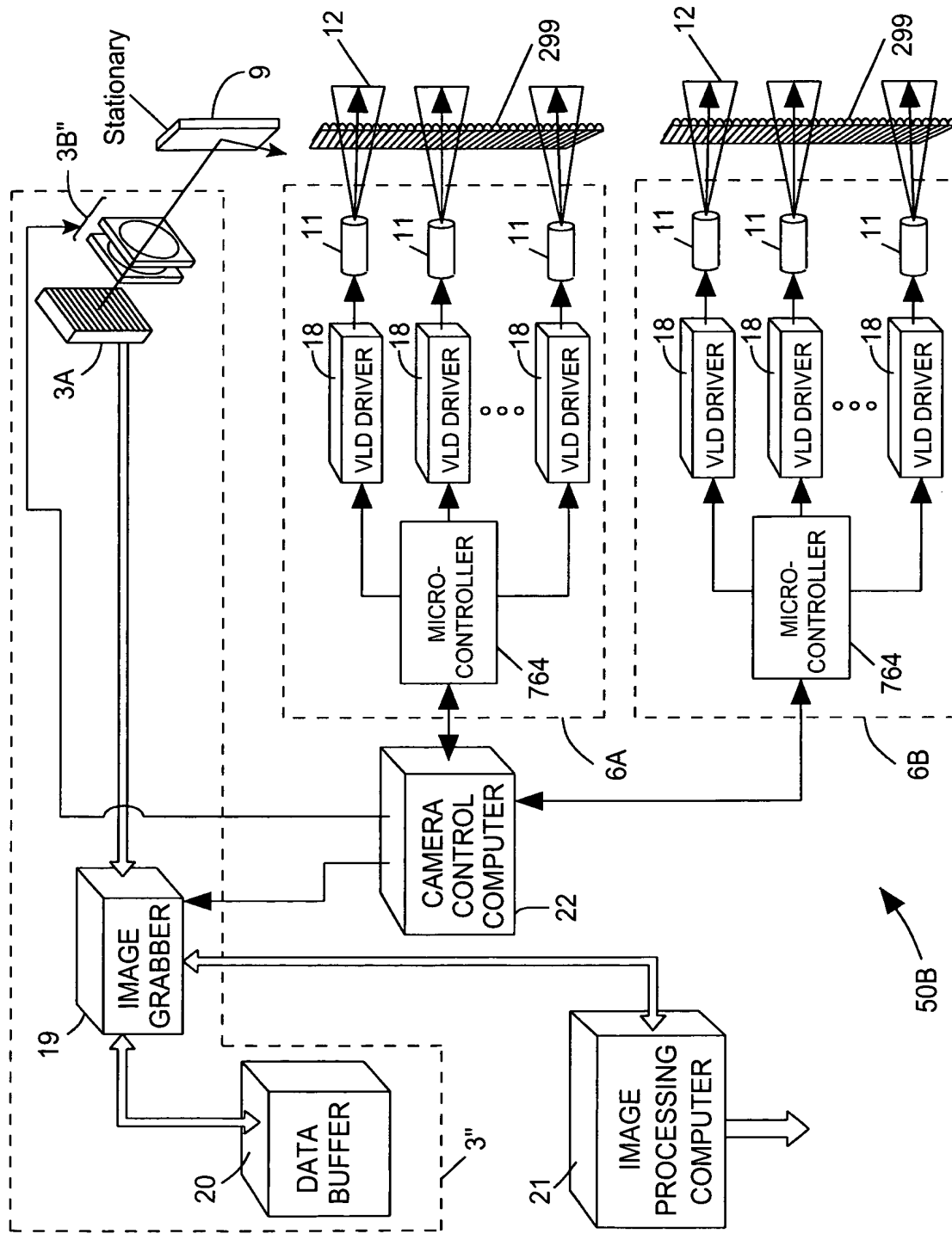


FIG. 3E2

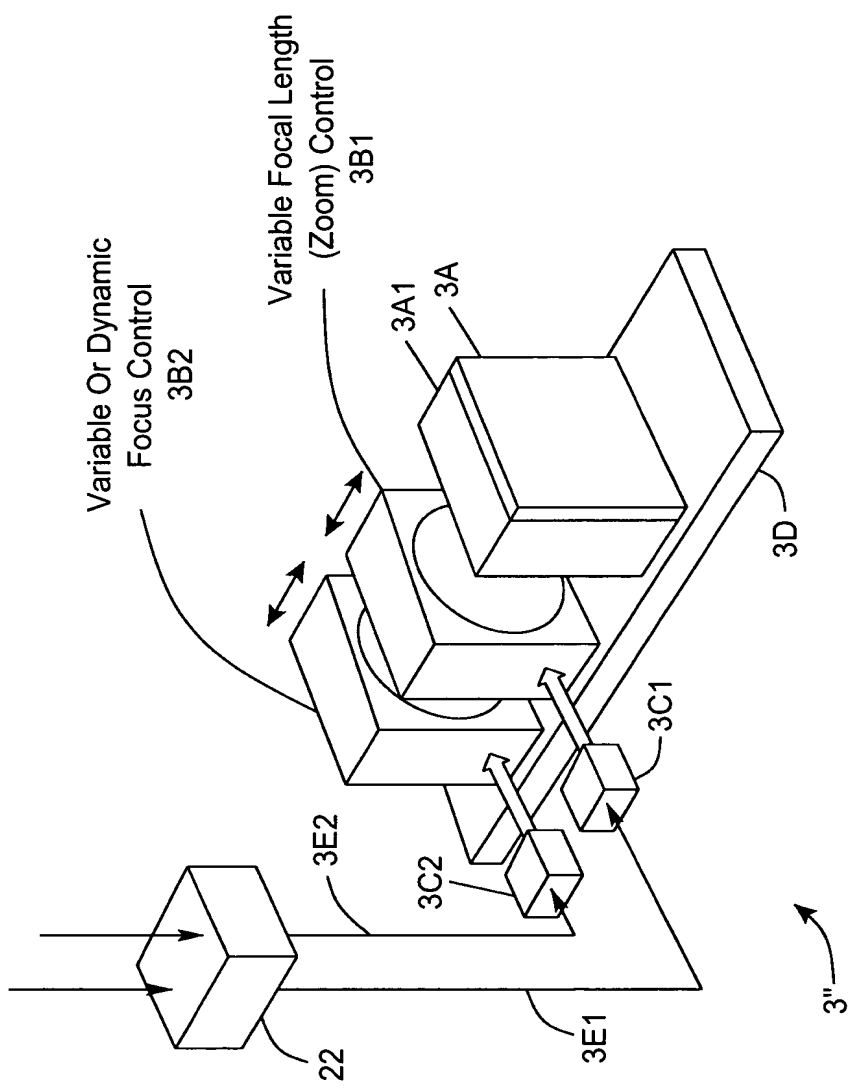


FIG. 3E3

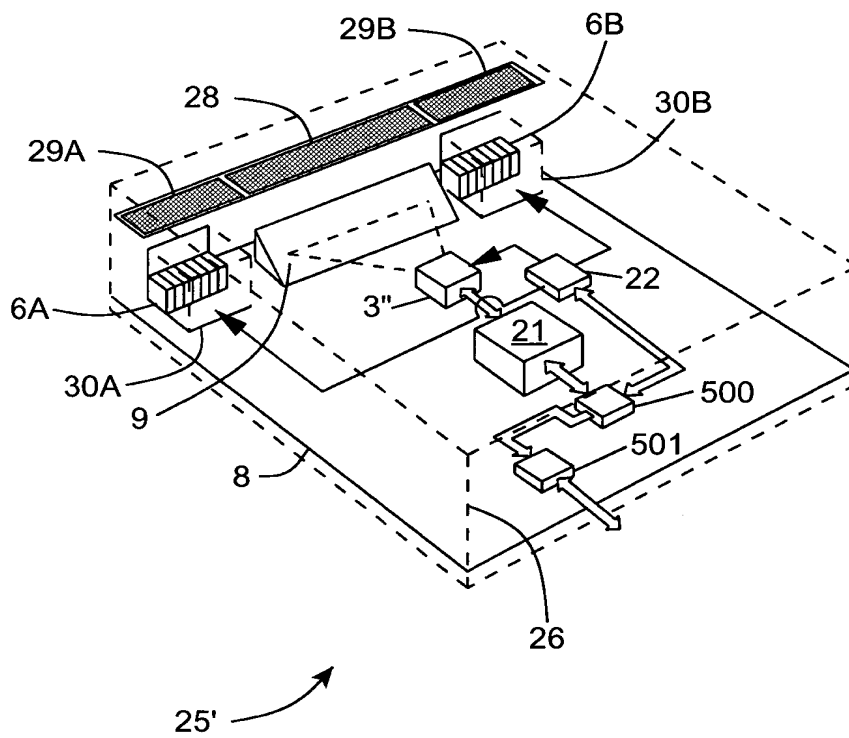


FIG. 3E4

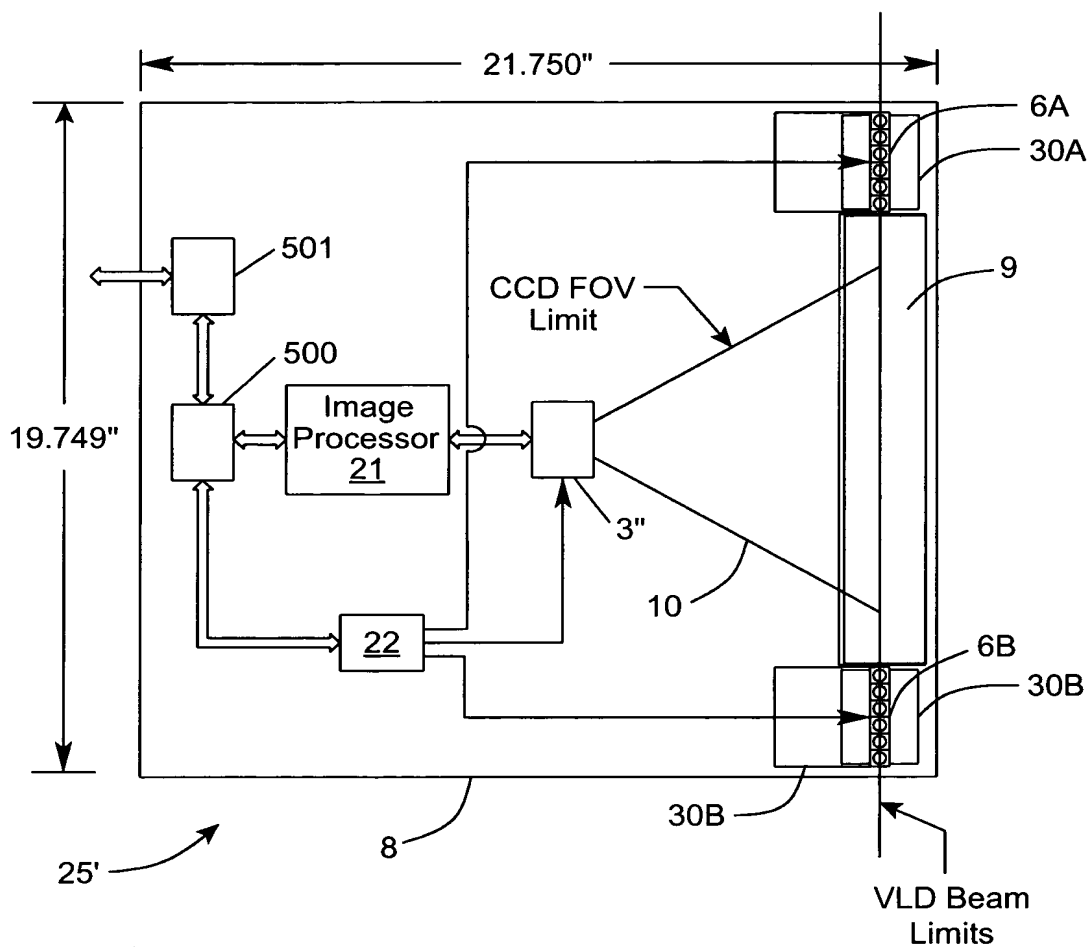


FIG. 3E5

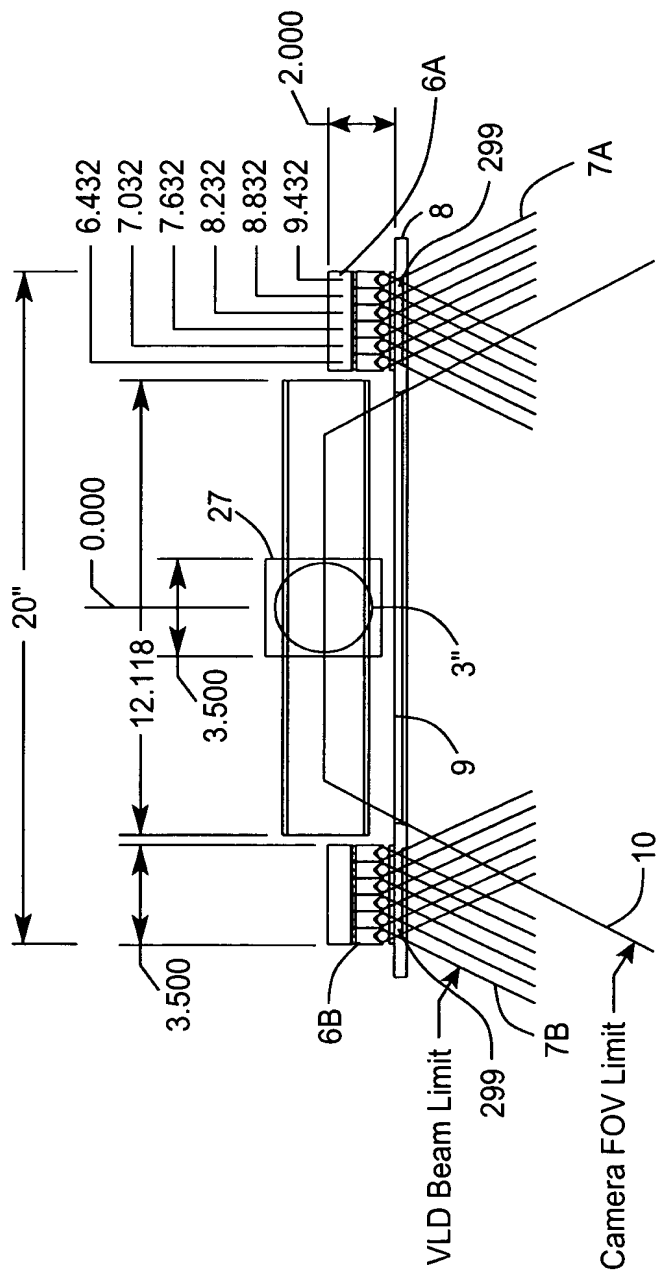


FIG. 3E6

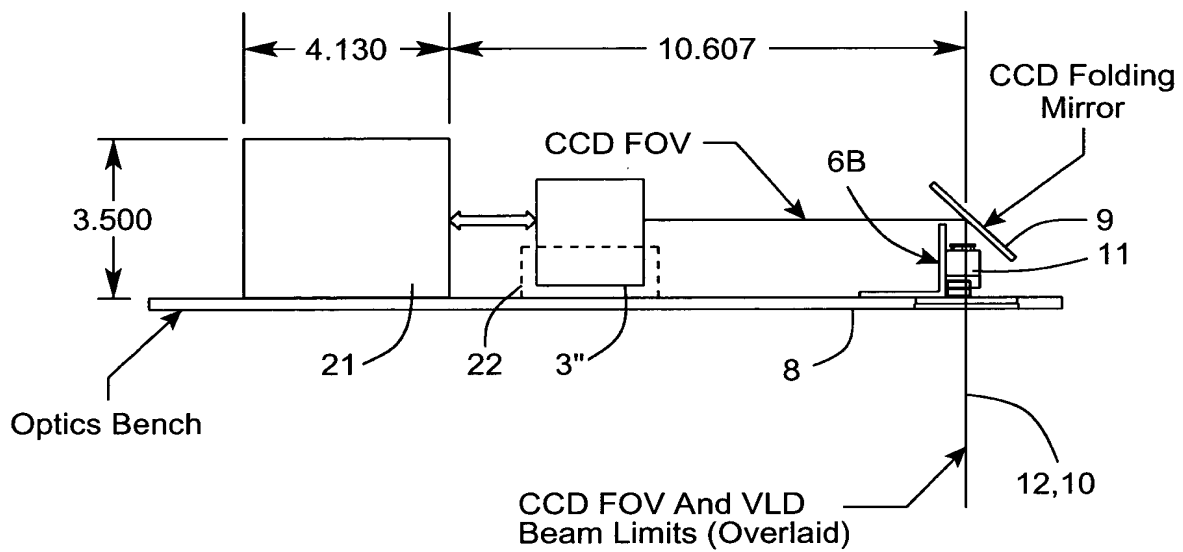


FIG. 3E7



* Variable FOV

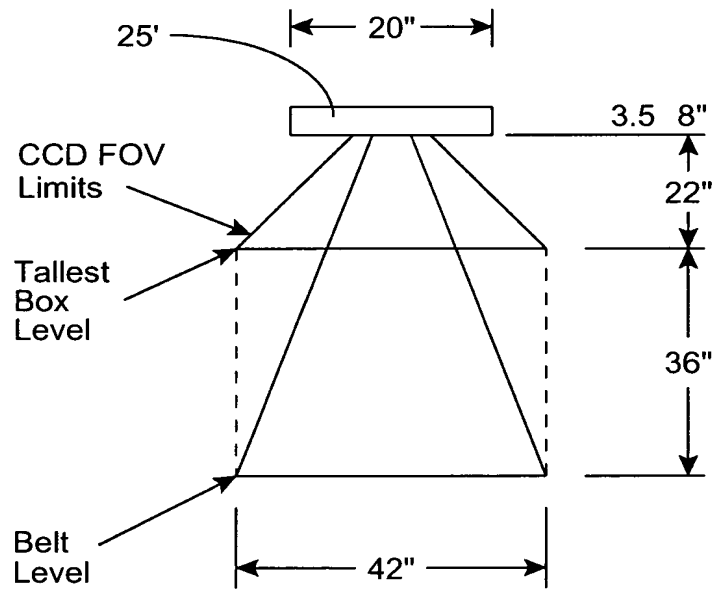
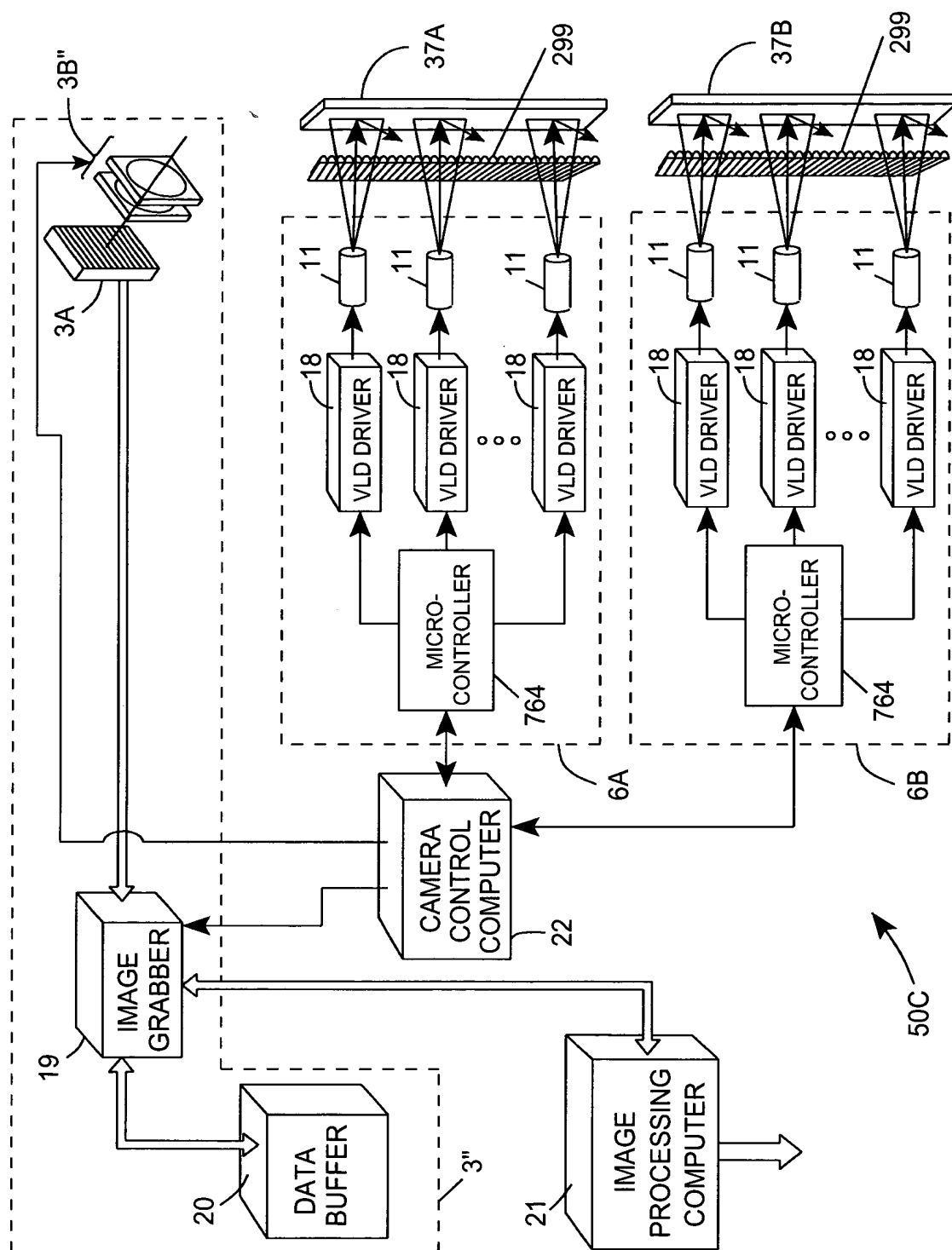


FIG. 3E8



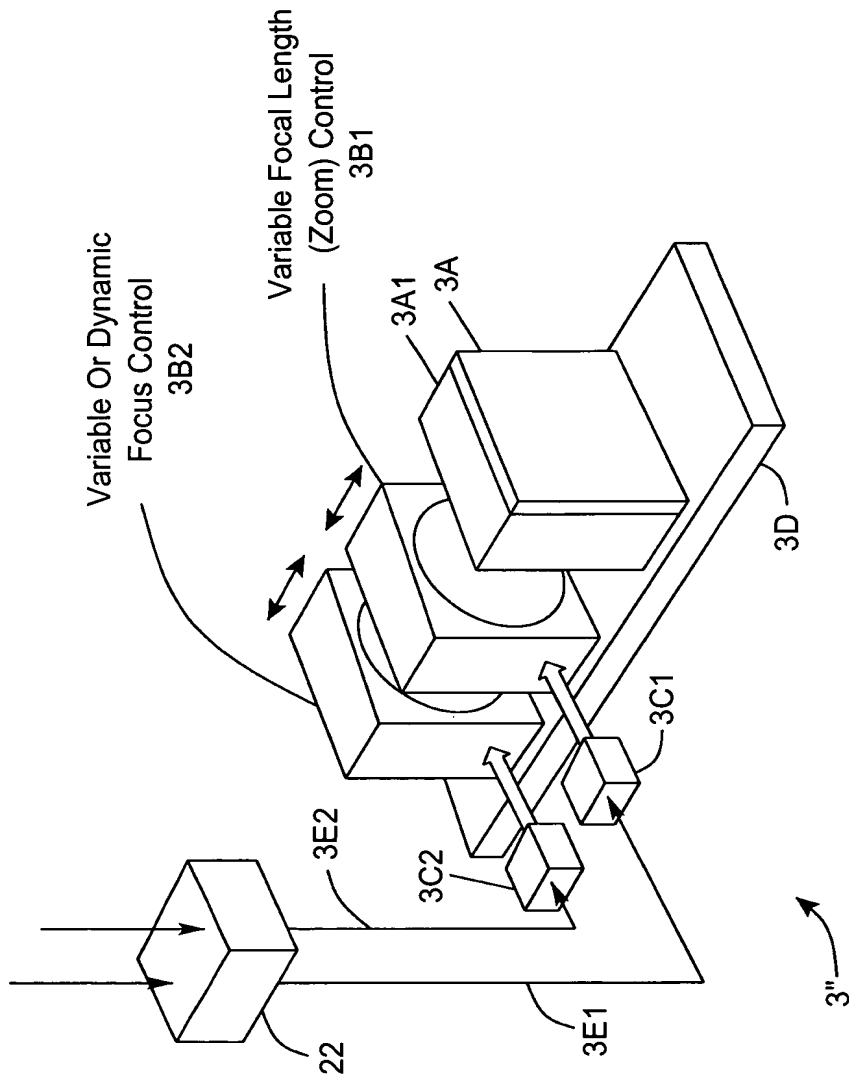


FIG. 3F3

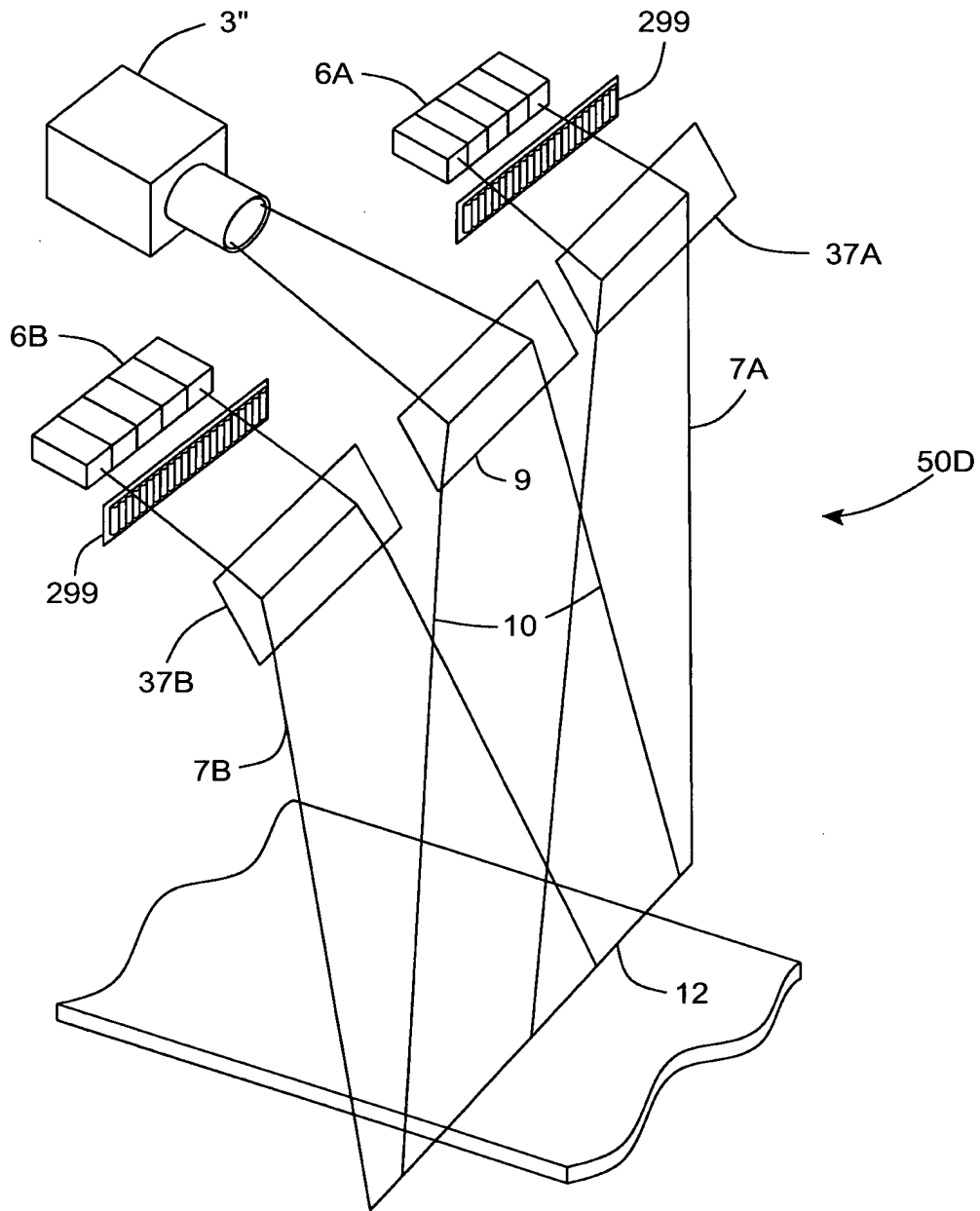


FIG. 3G1

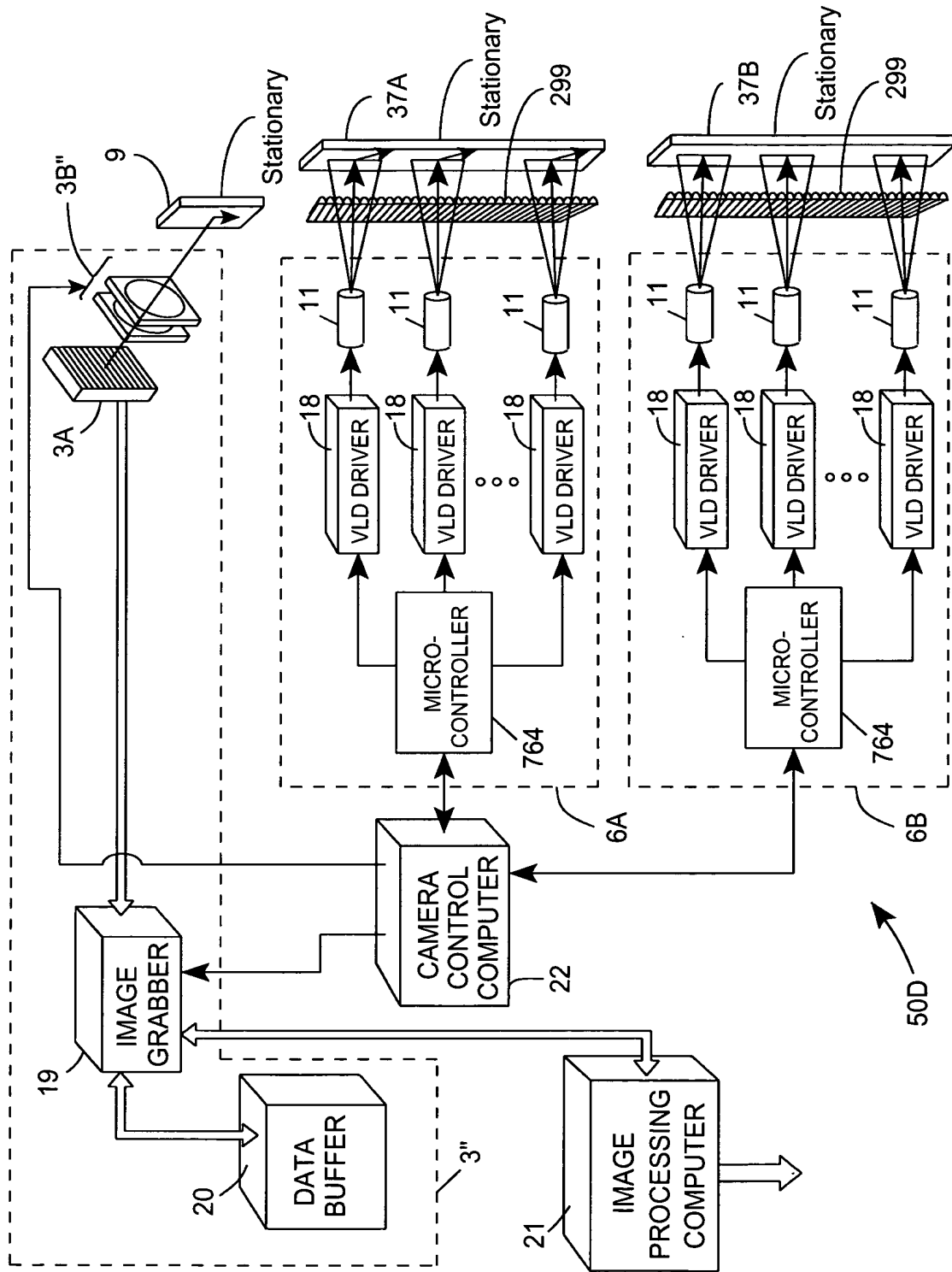


FIG. 3G2

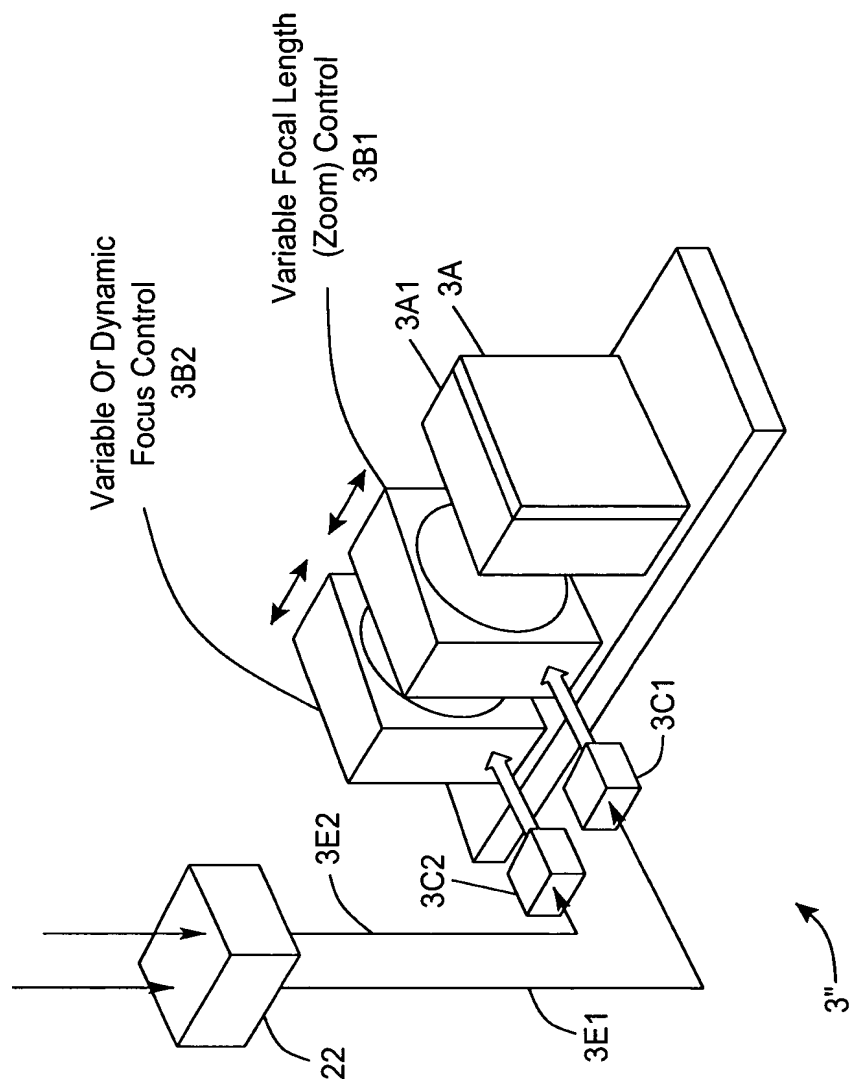


FIG. 3G3



- Variable Focal Length Imaging Lens
- Variable Focal Distance

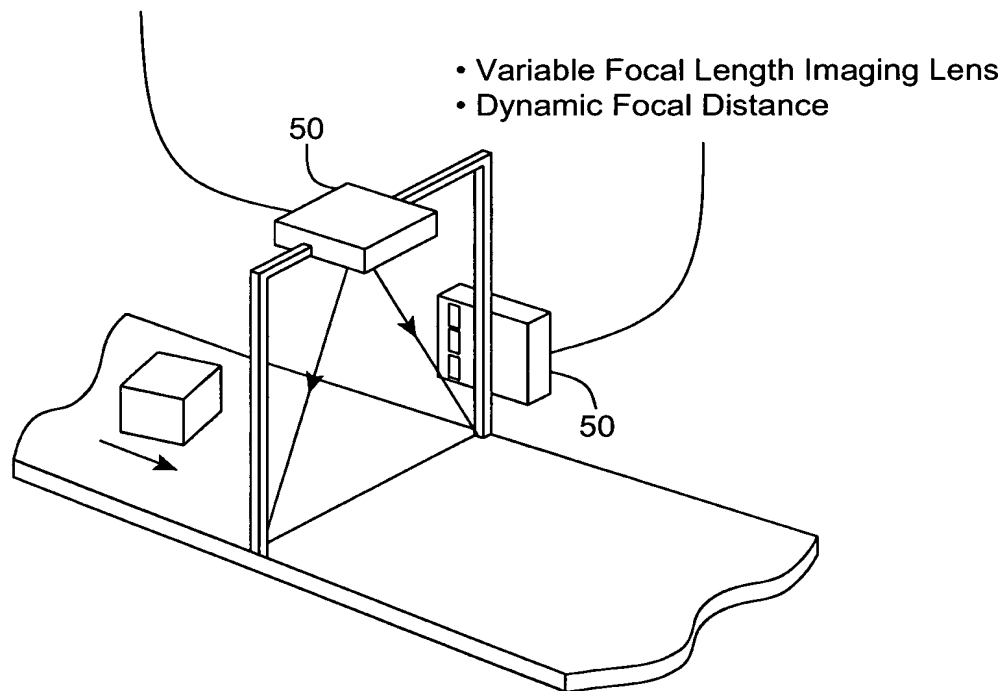


FIG. 3H

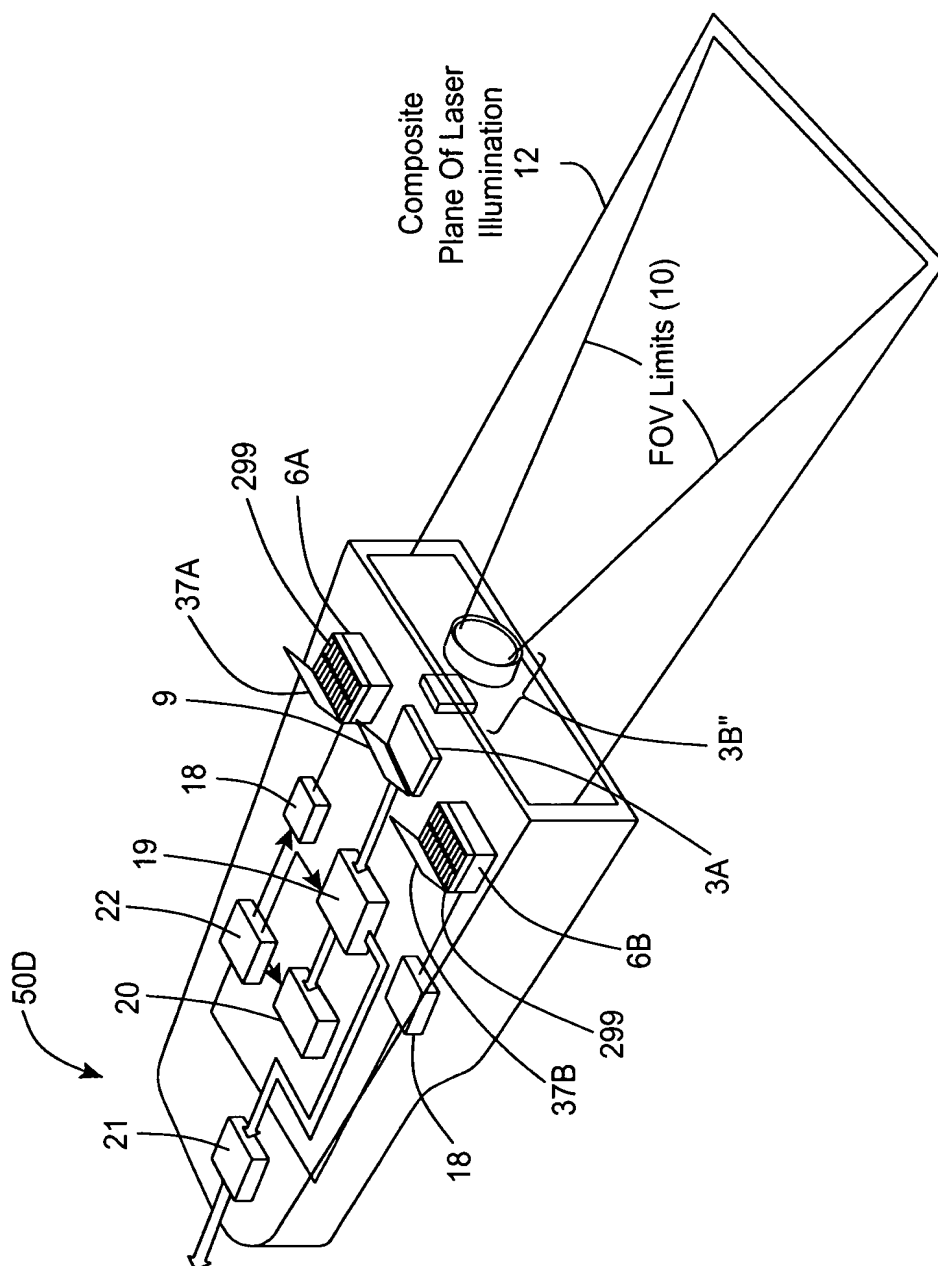


FIG. 31

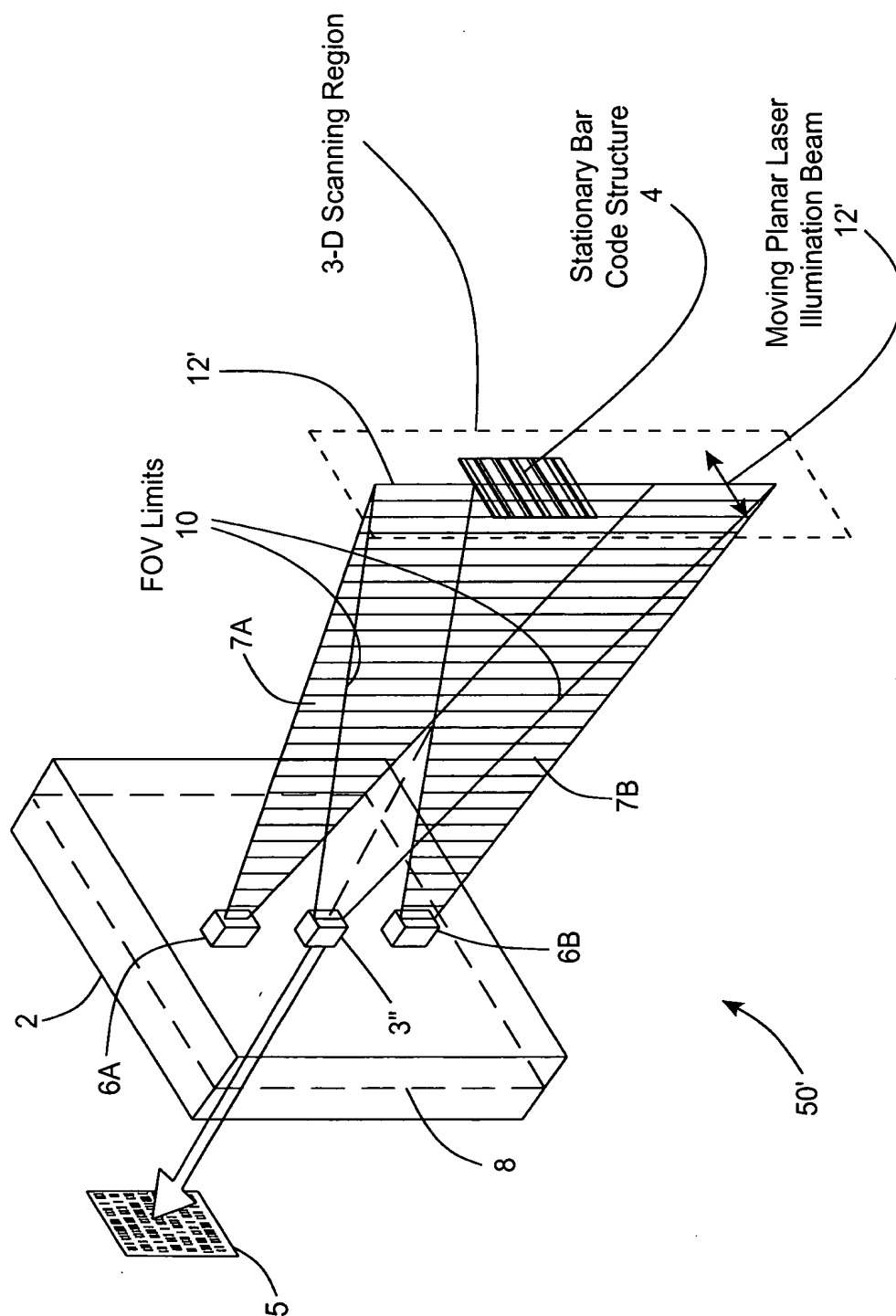


FIG. 3J1

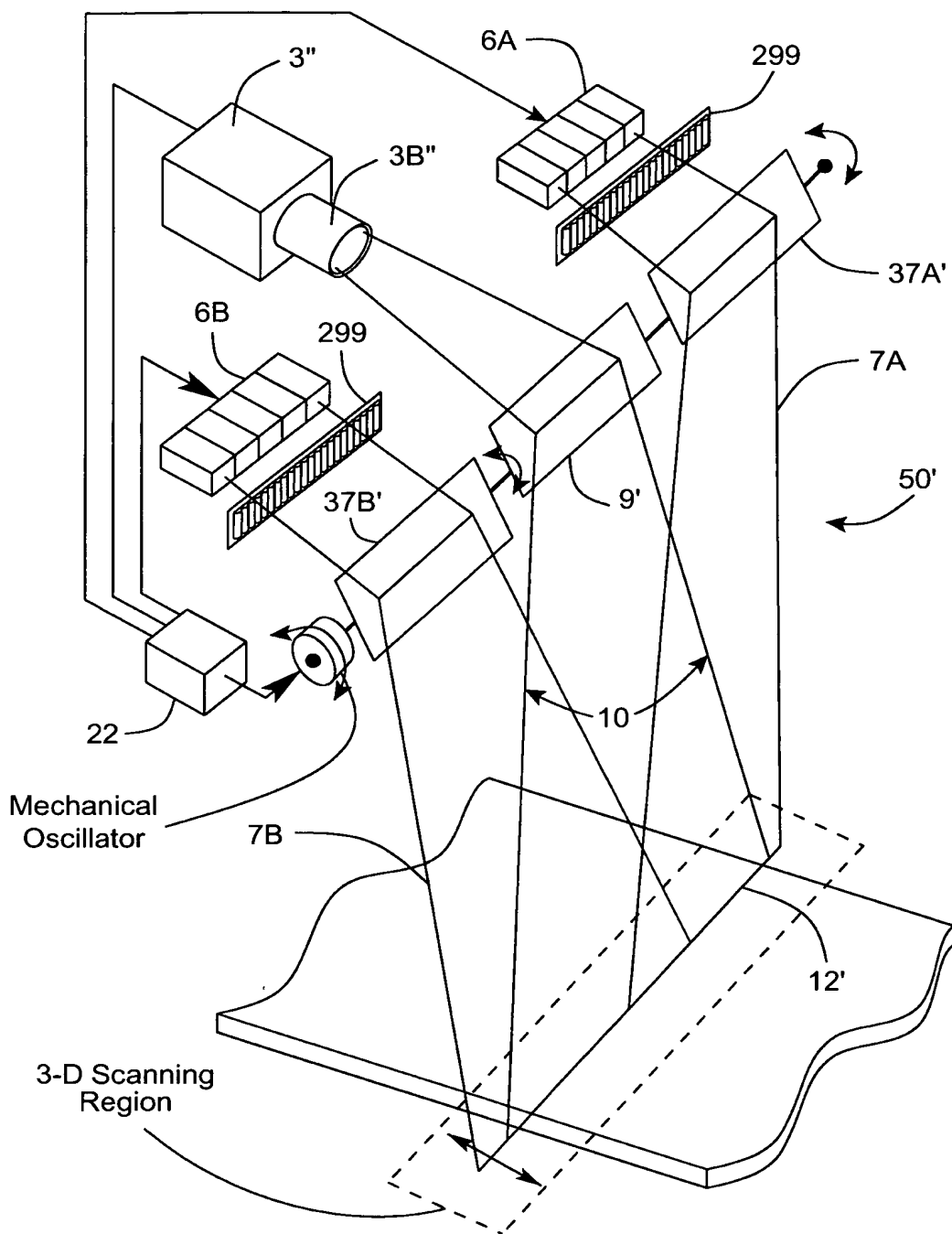


FIG. 3J2

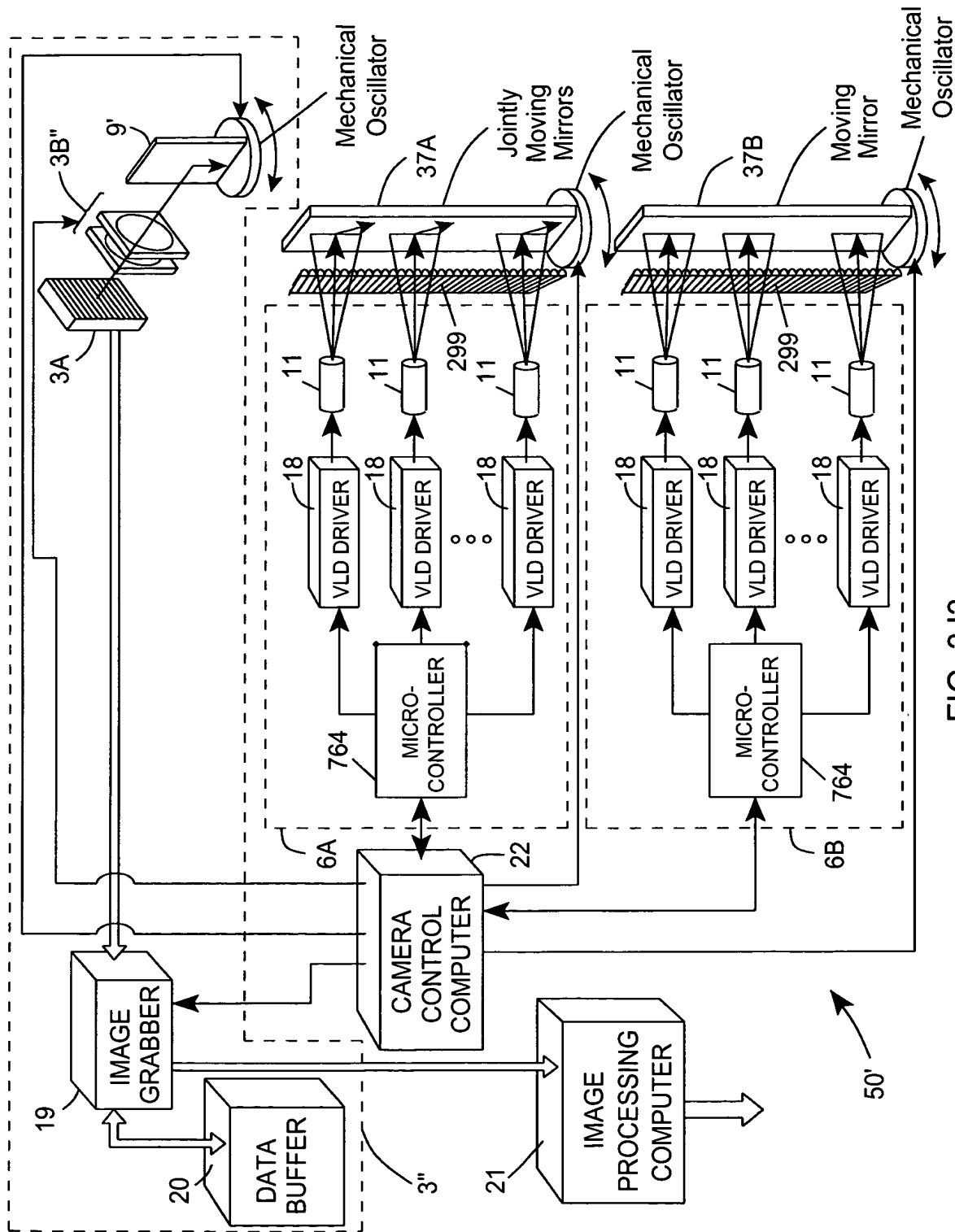


FIG. 3J3

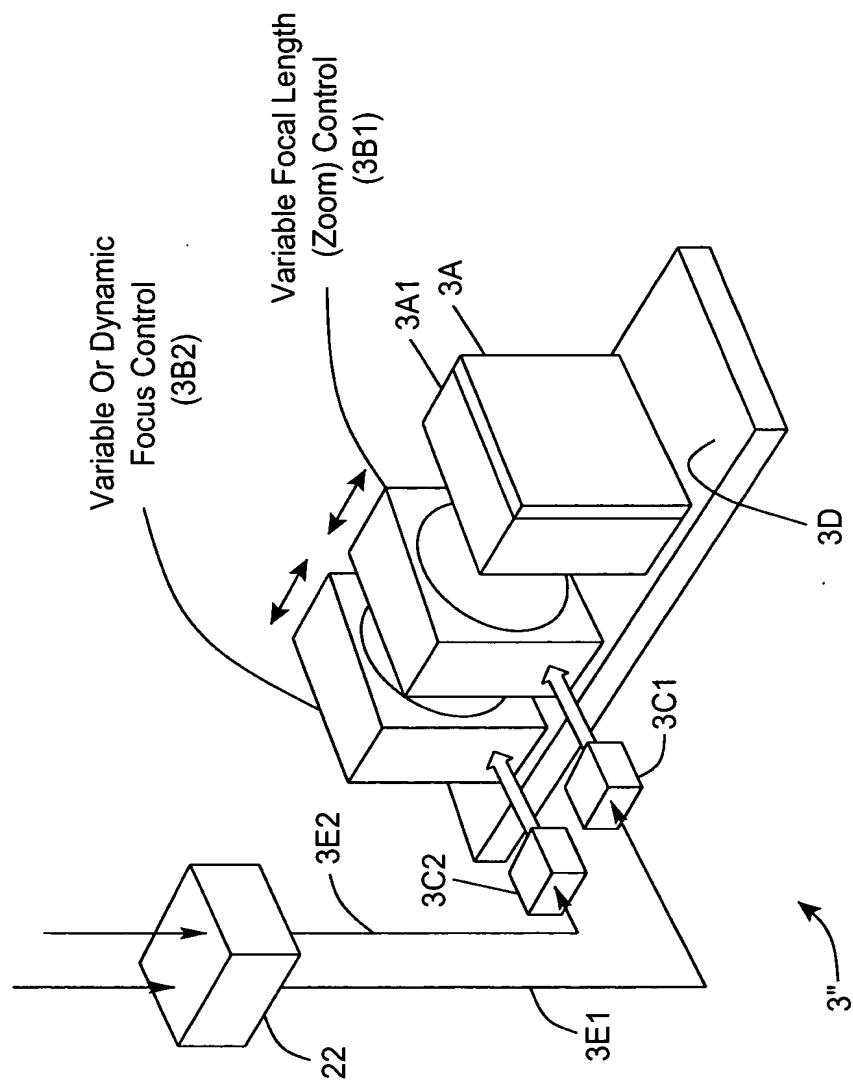


FIG. 3J4

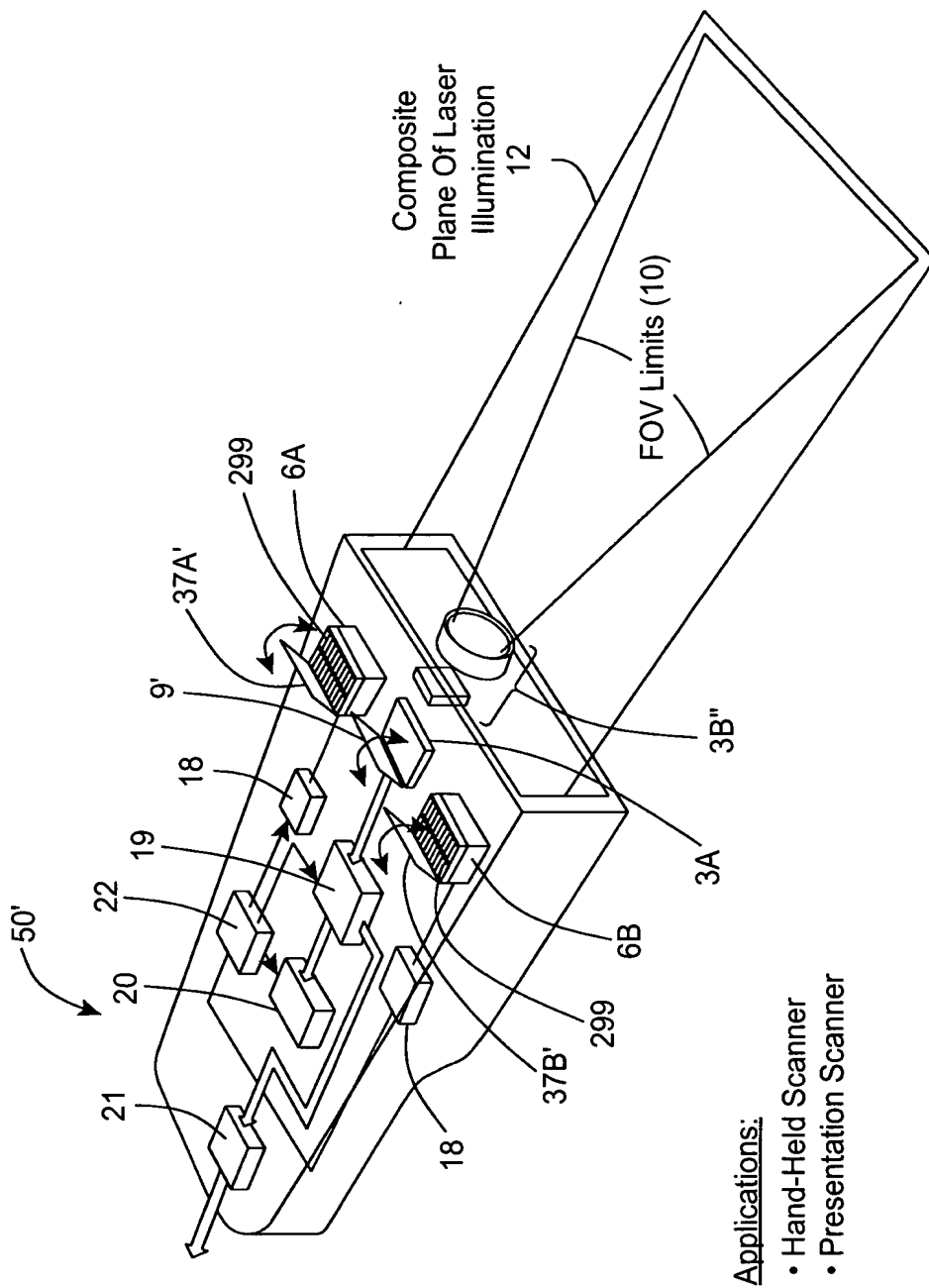
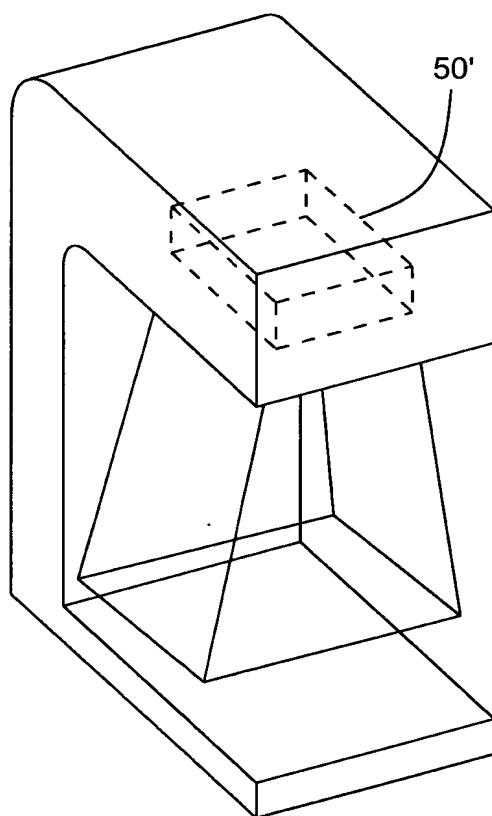


FIG. 3J5



2-D Hold-under Scanner

FIG. 3J6

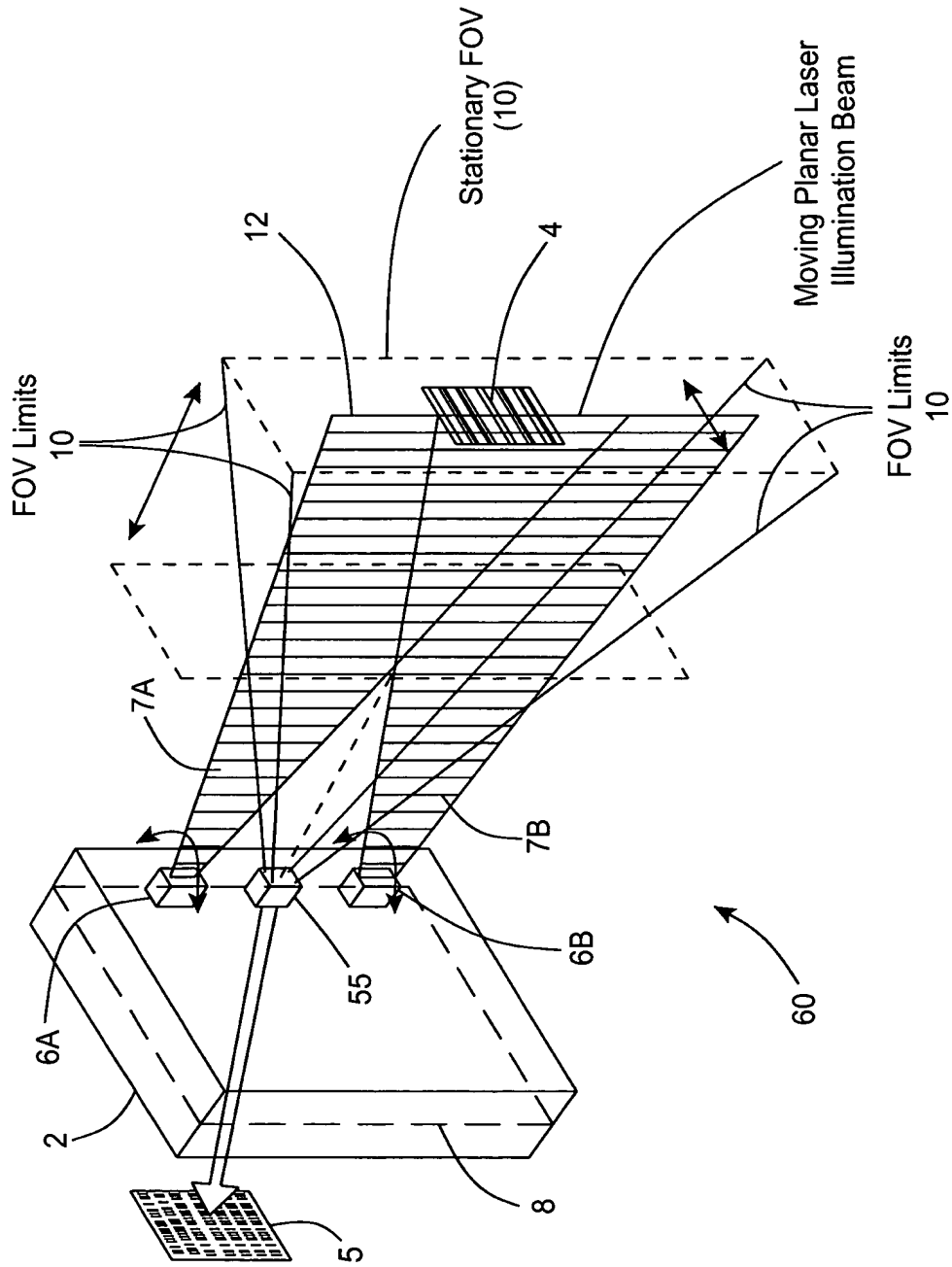


FIG. 4A

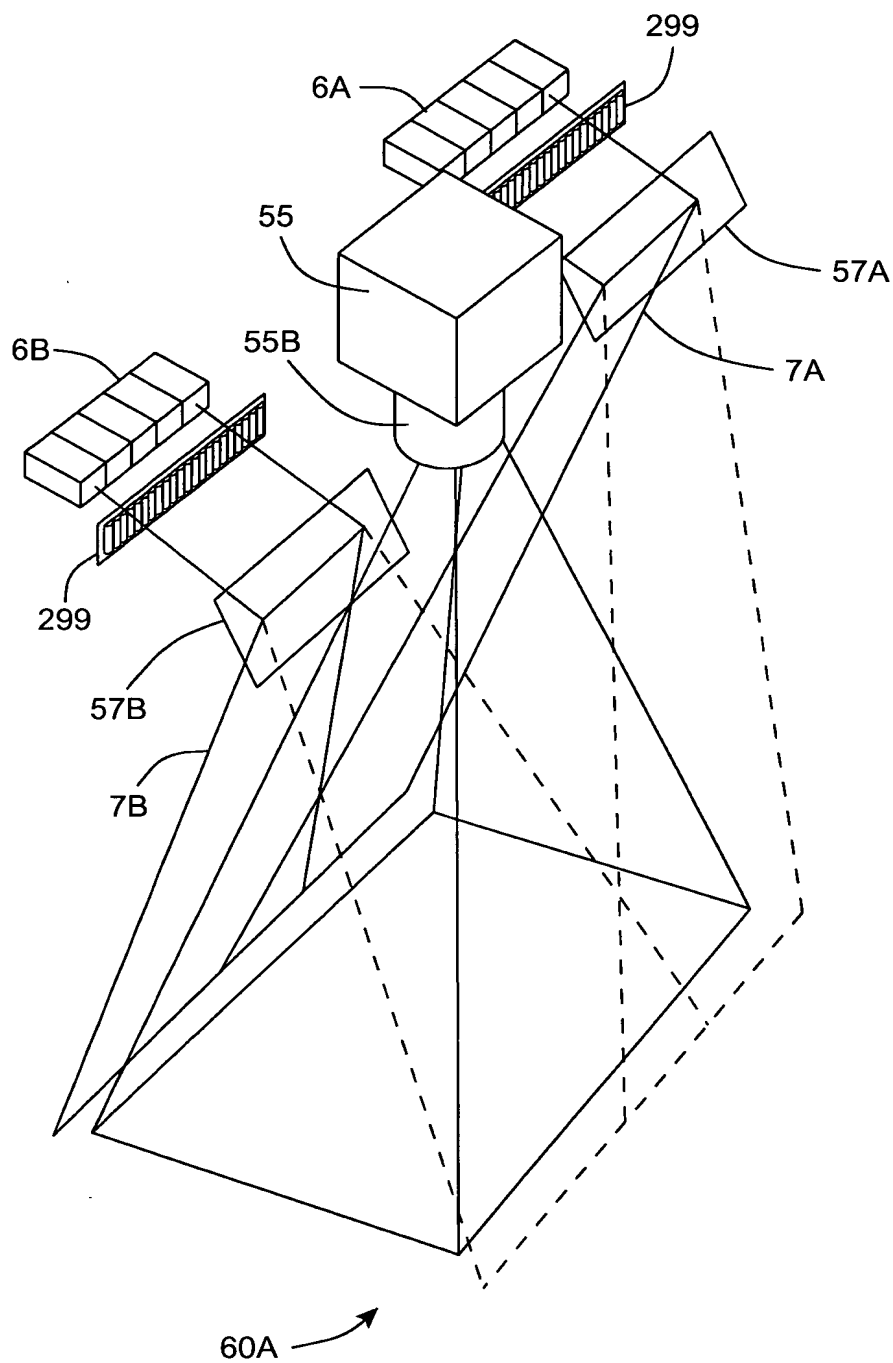


FIG. 4B1

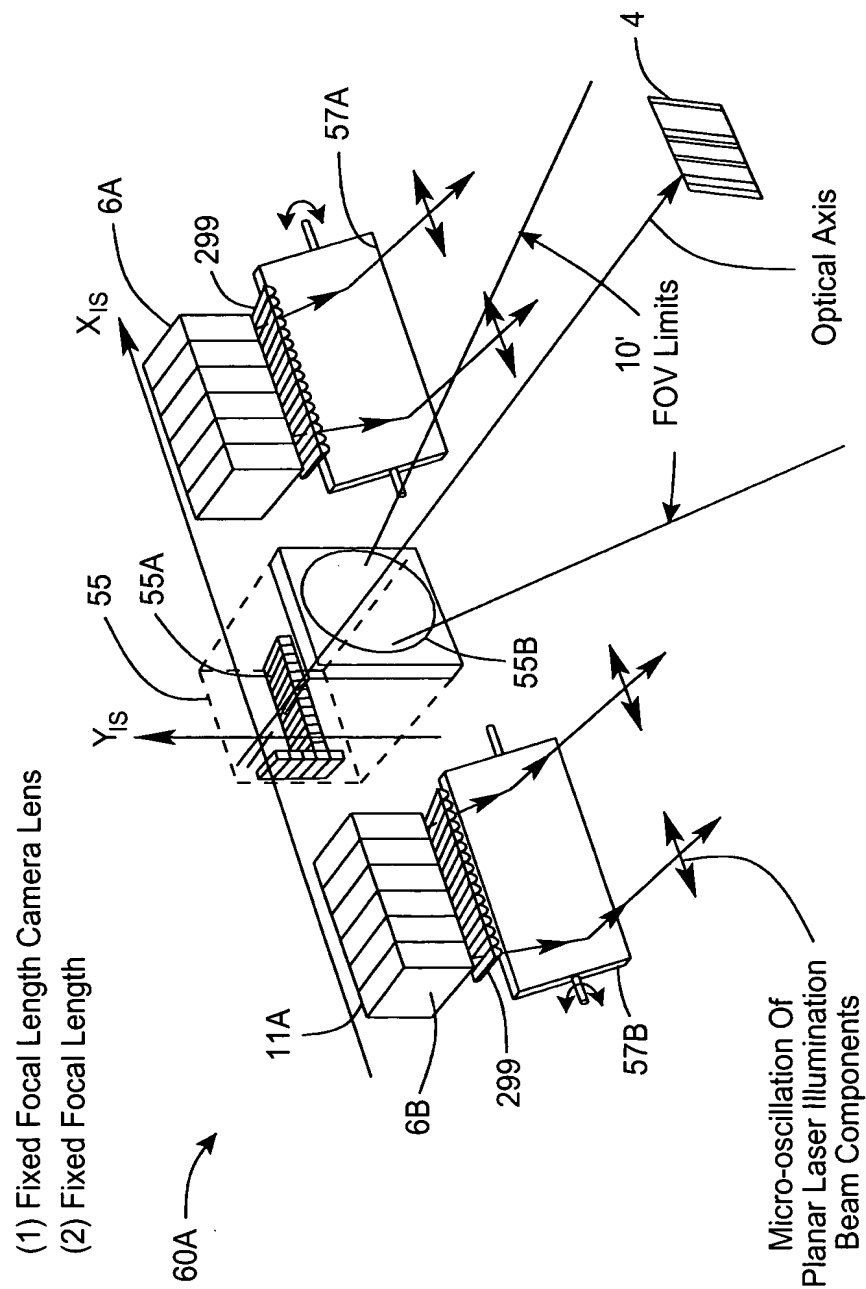


FIG. 4B2

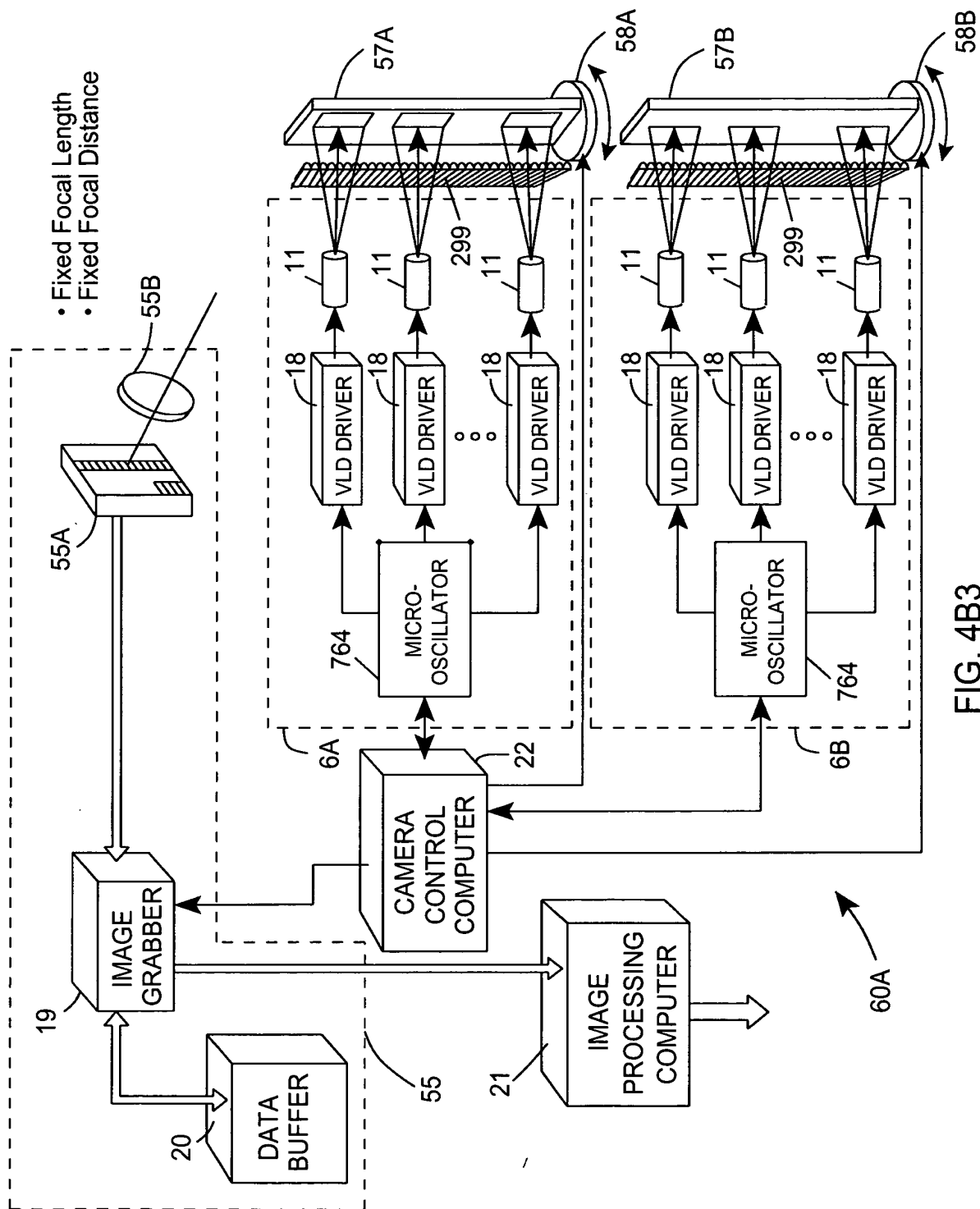


FIG. 4B3

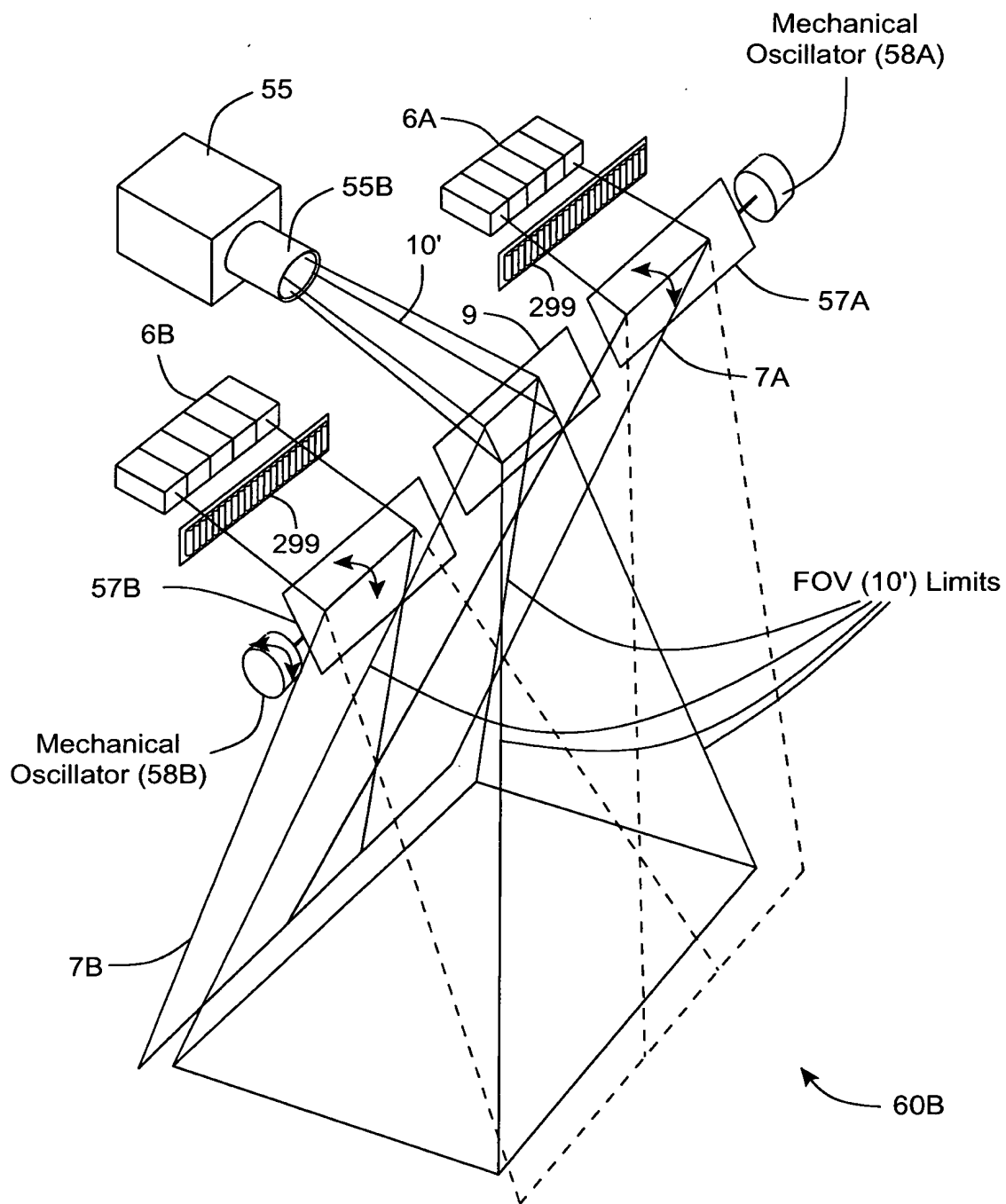


FIG. 4C1

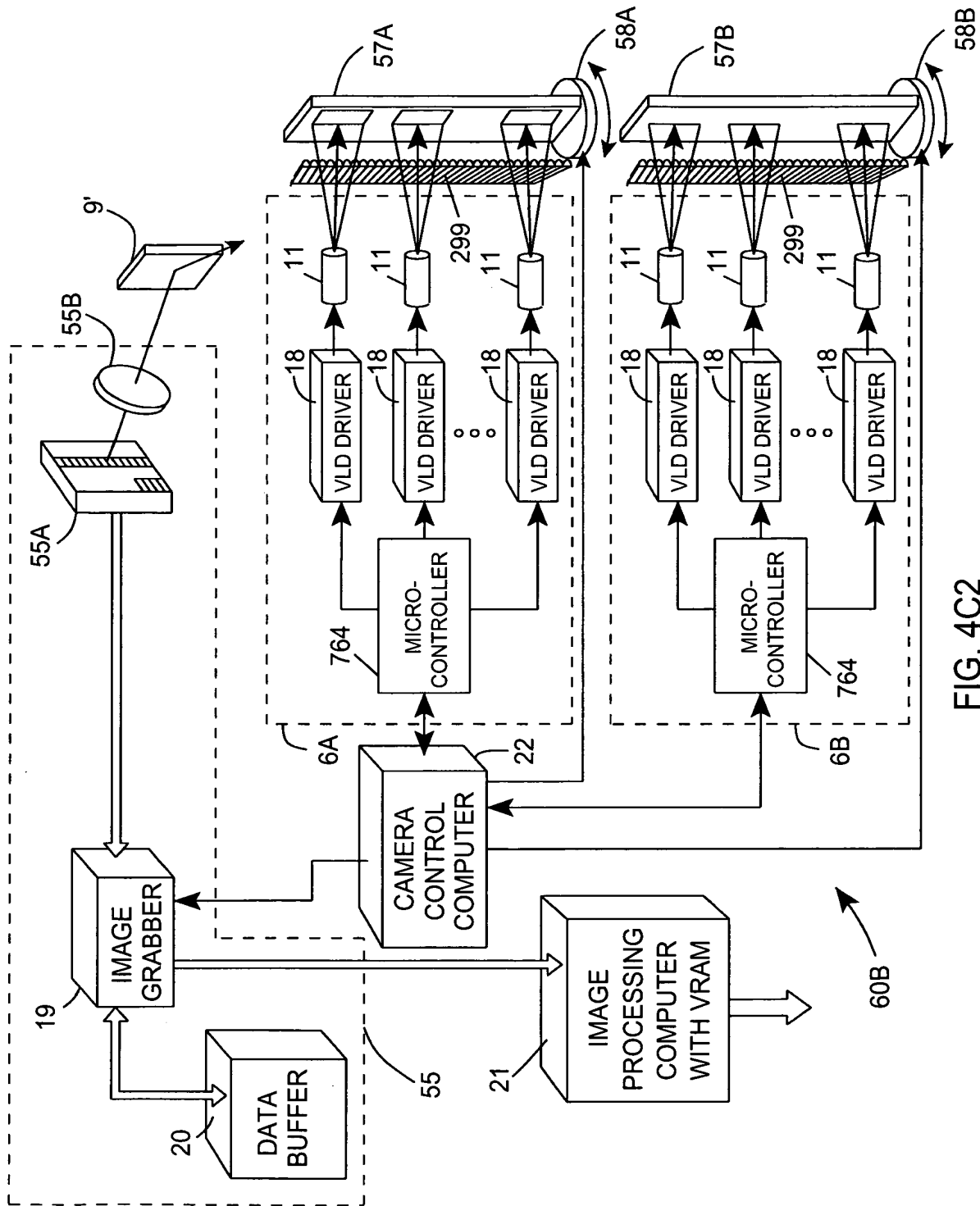
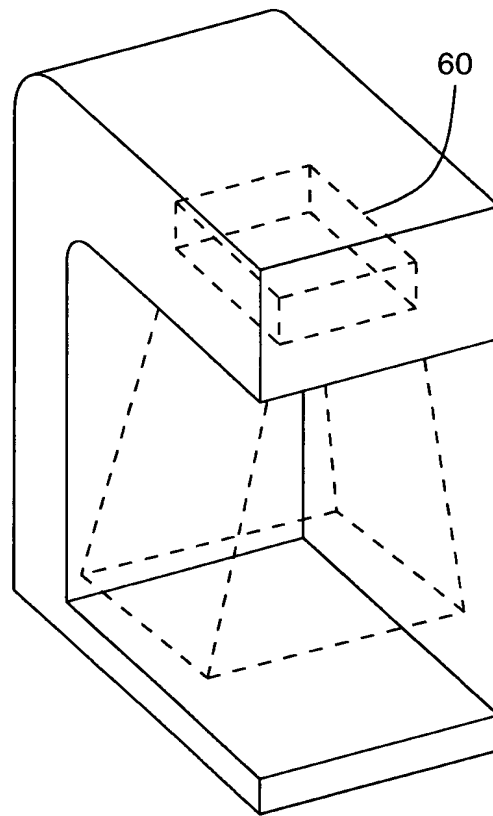


FIG. 4C2



2-D Hold-under Scanner

FIG. 4D

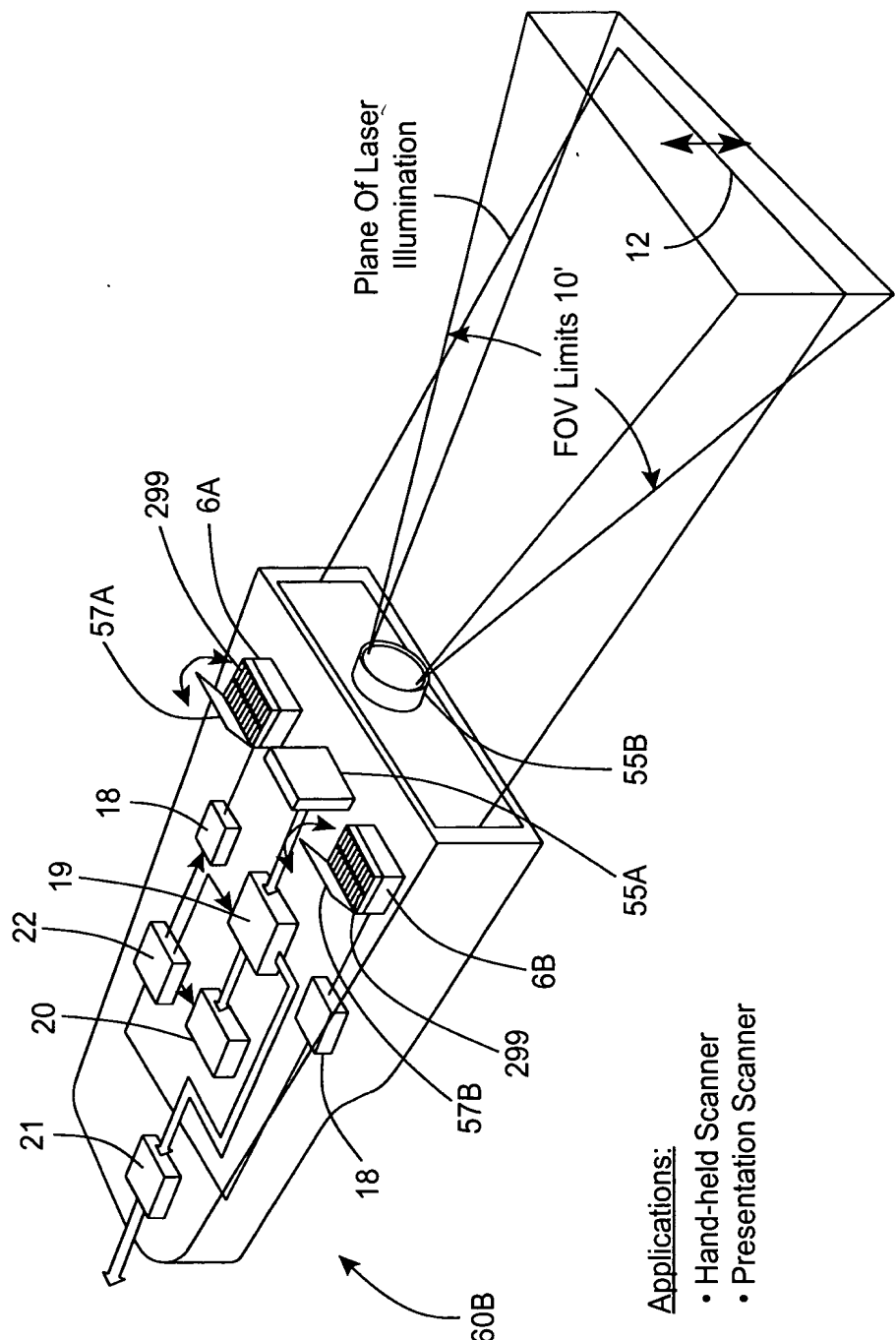


FIG. 4E

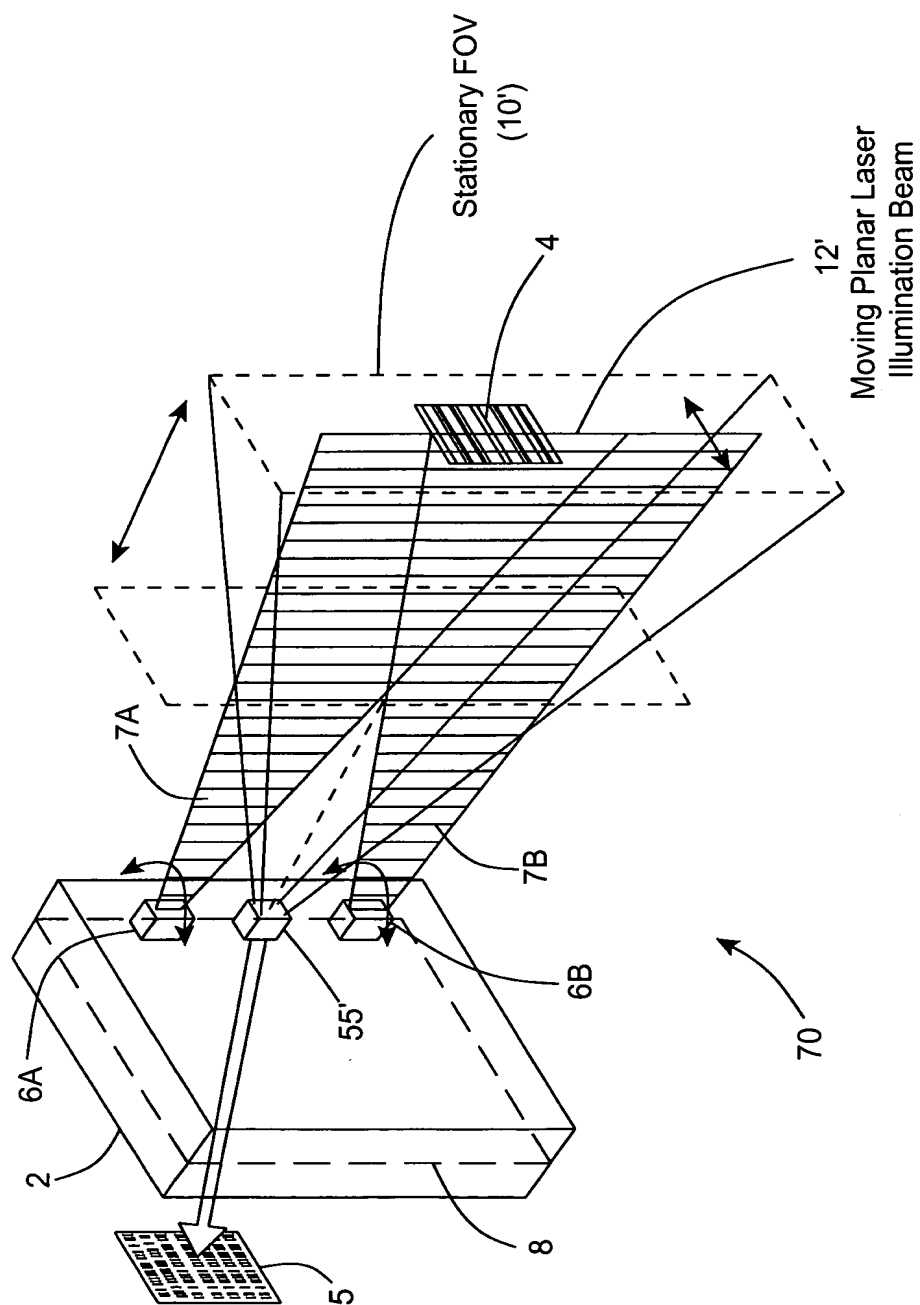


FIG. 5A

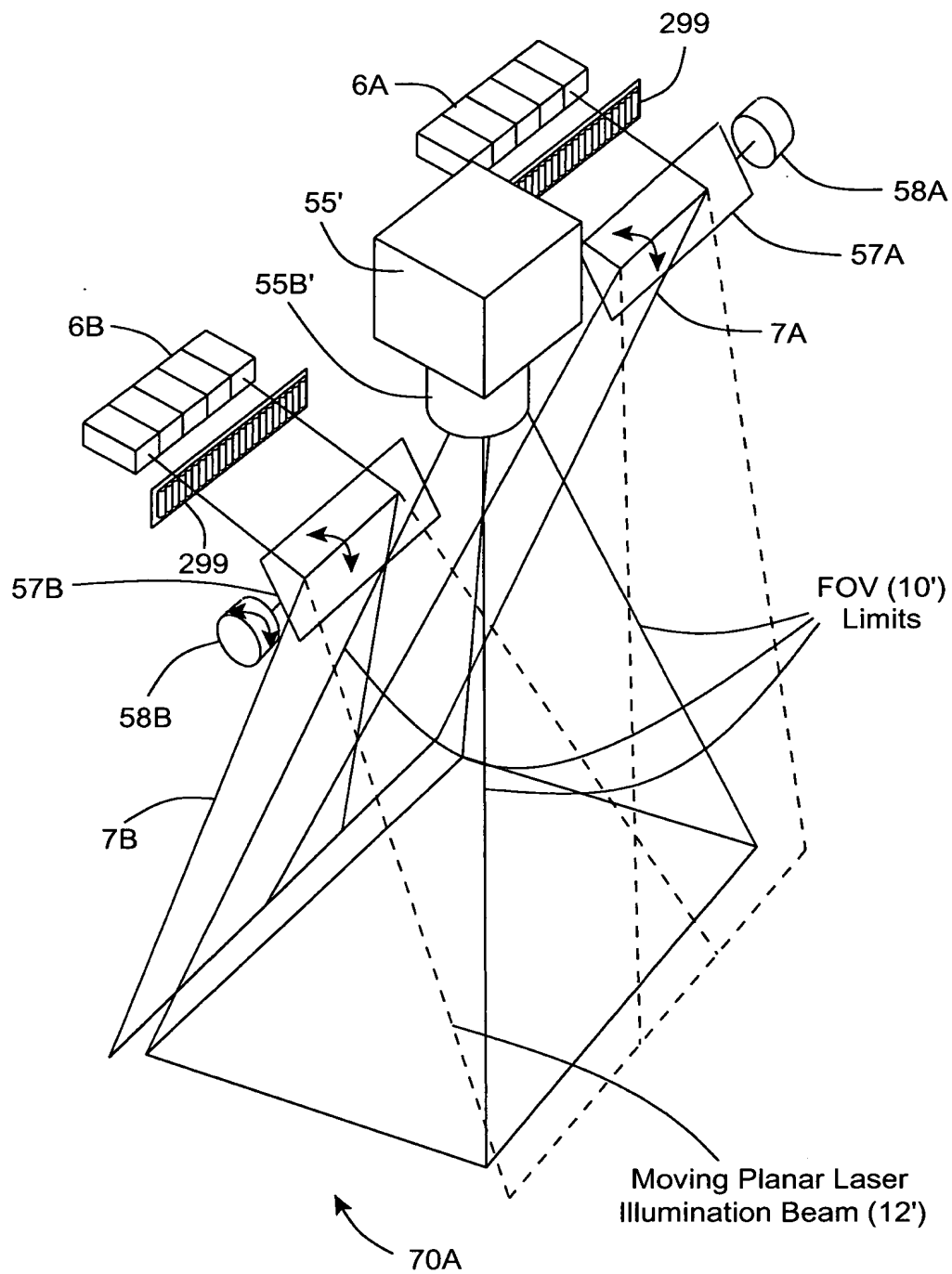


FIG. 5B1

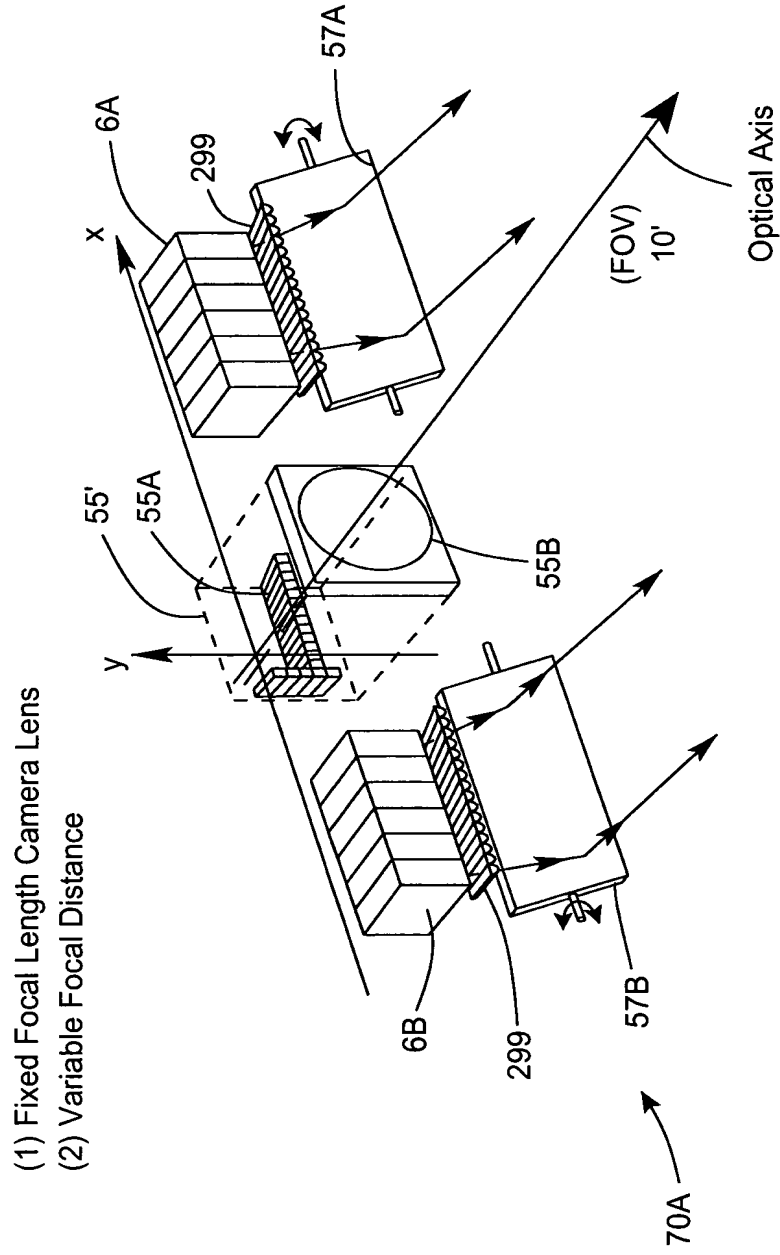


FIG. 5B2

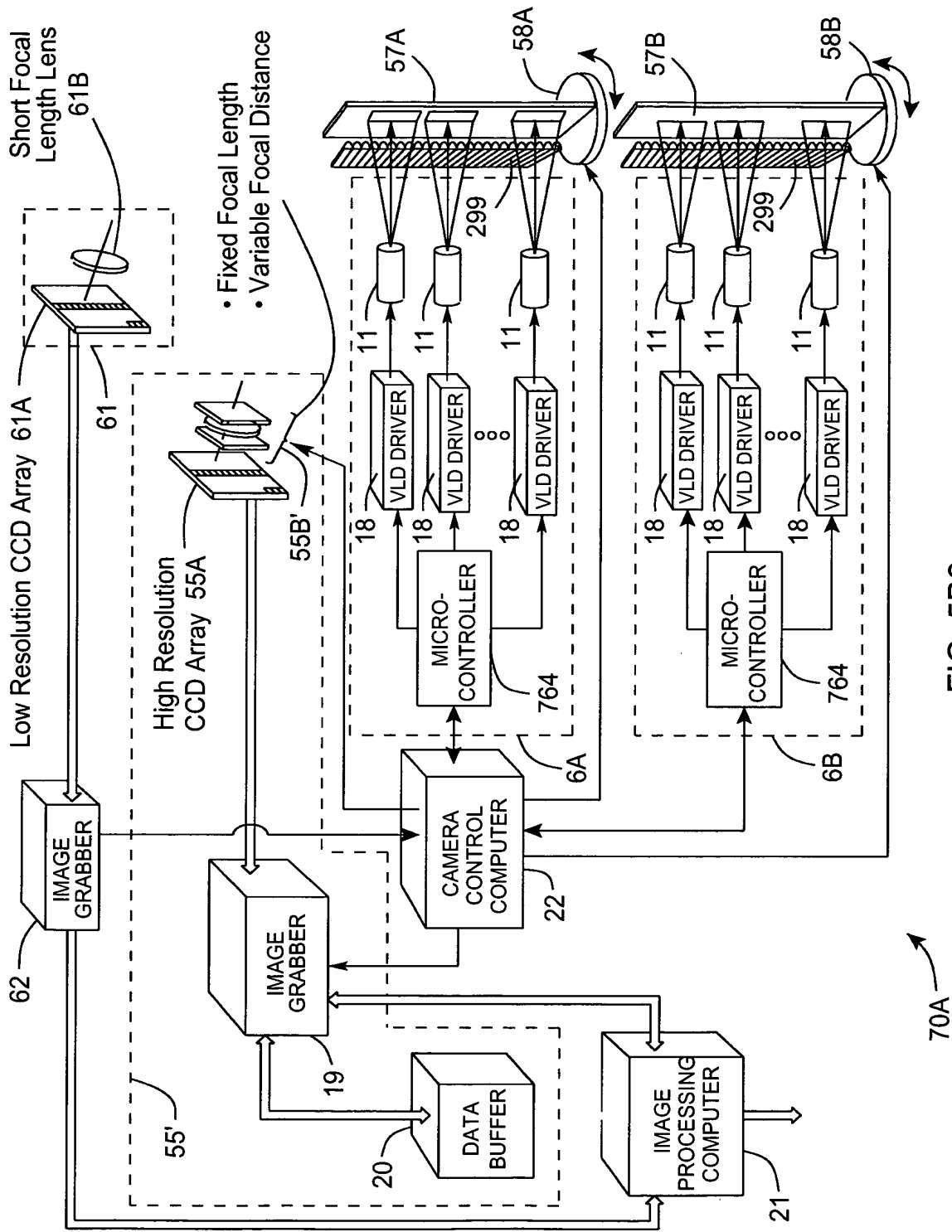


FIG. 5B3

70A

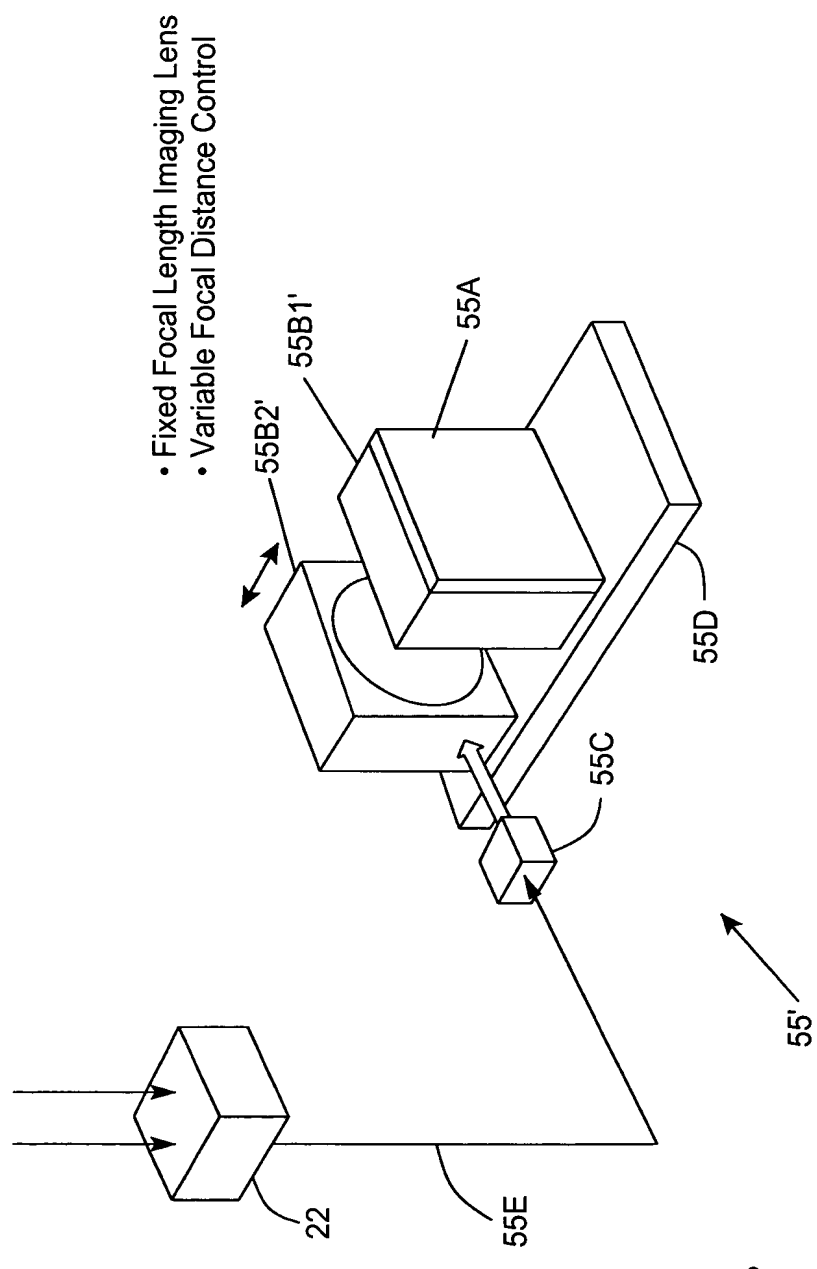


FIG. 5B4

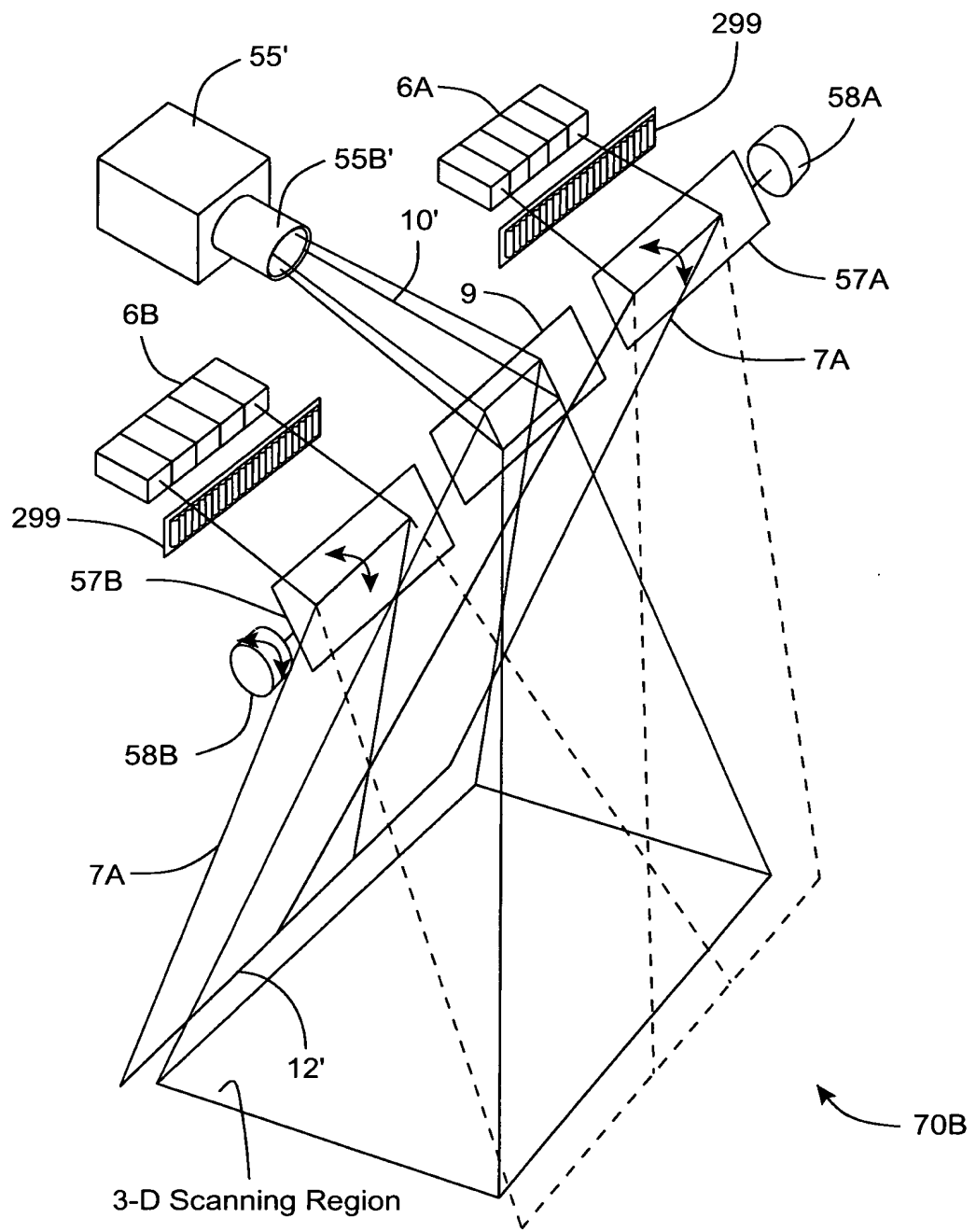


FIG. 5C1

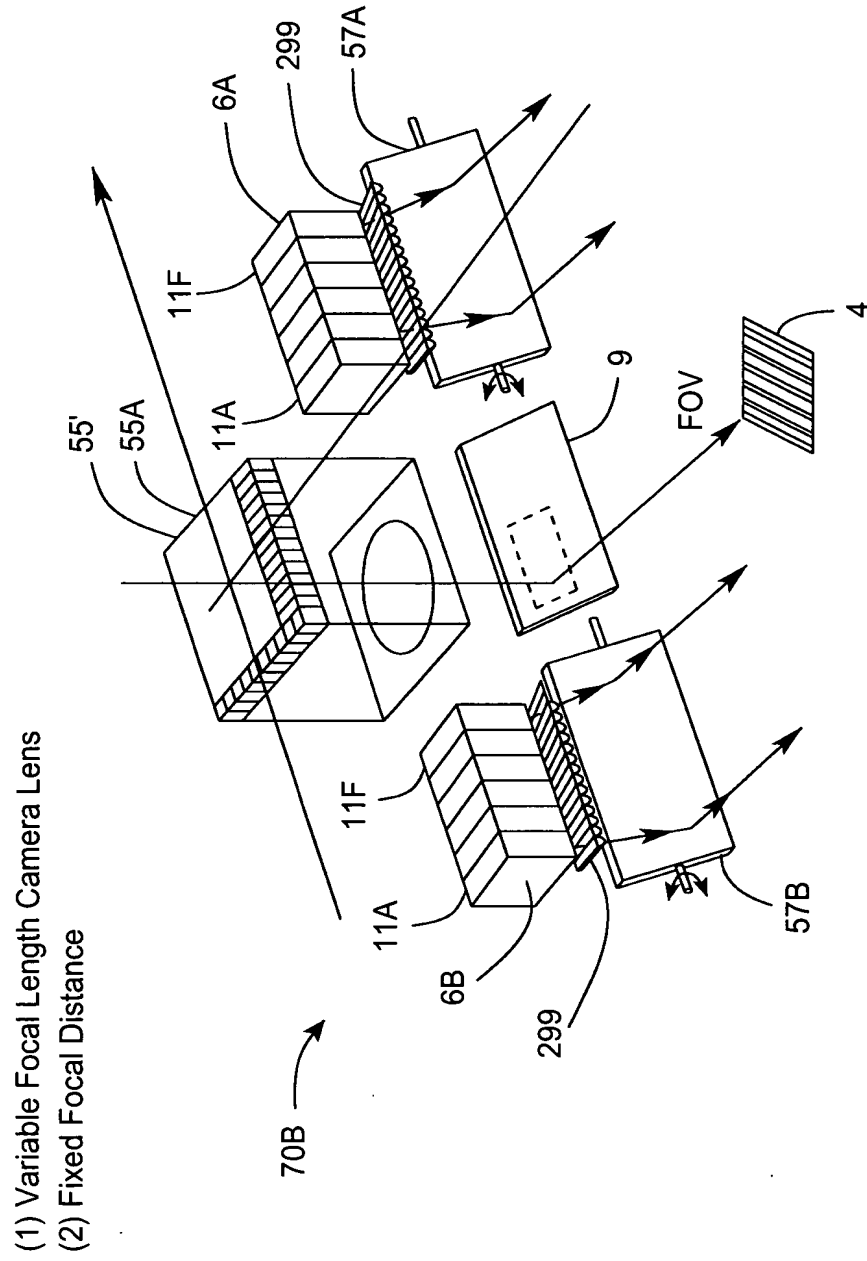


FIG. 5C2

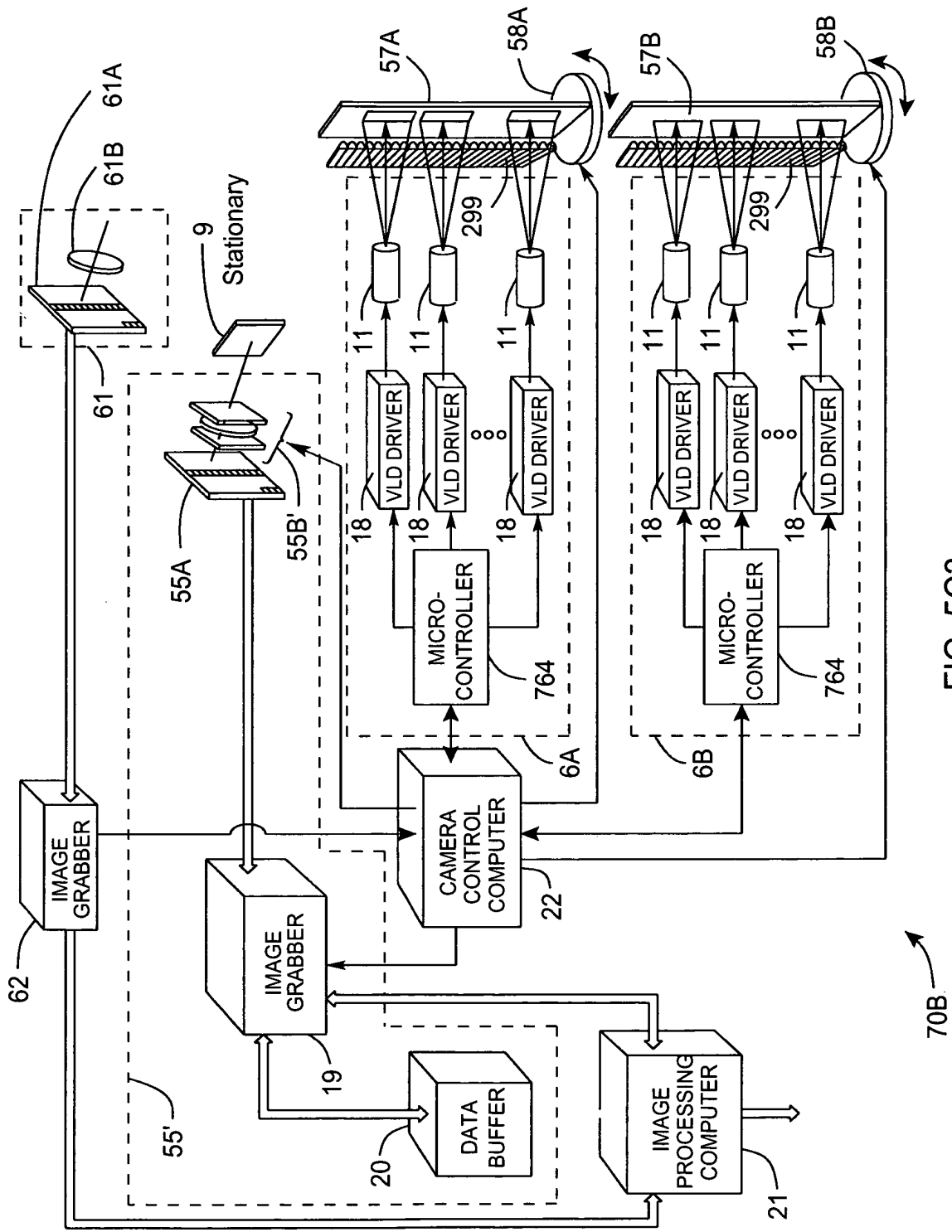


FIG. 5C3

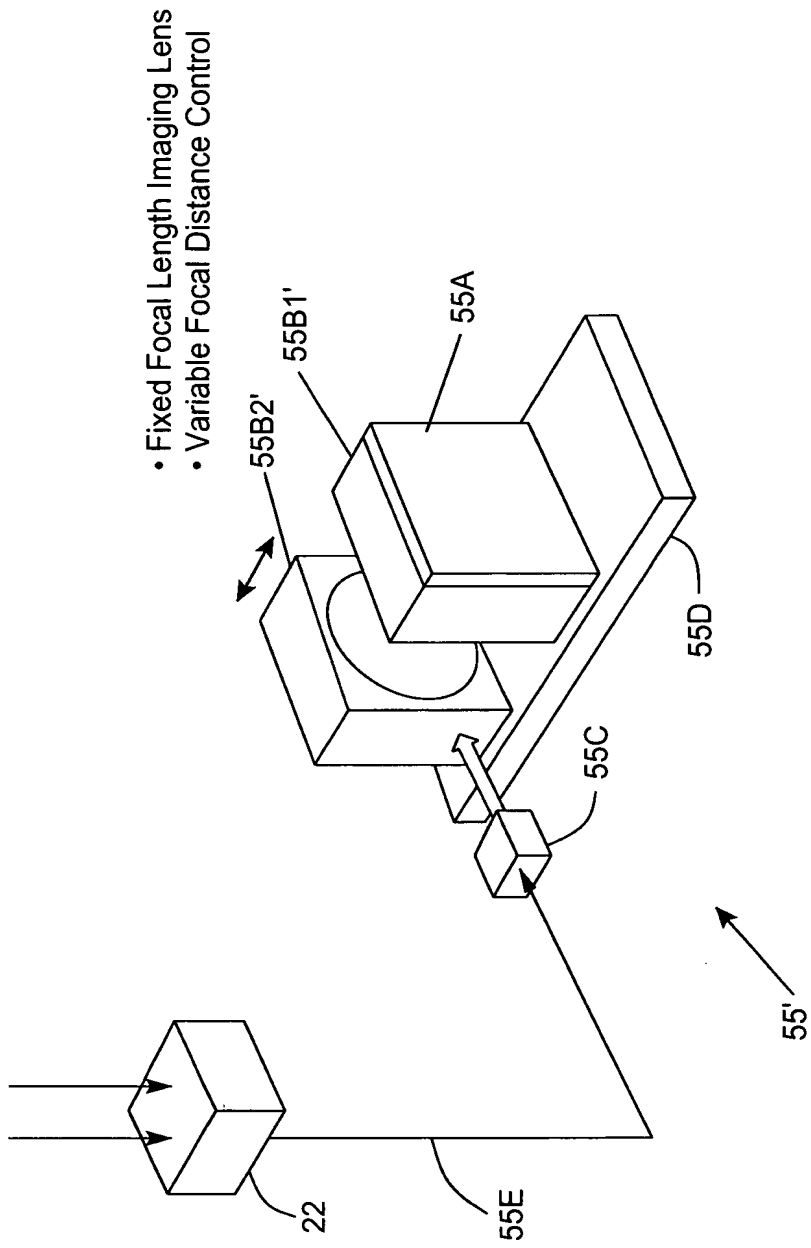


FIG. 5C4

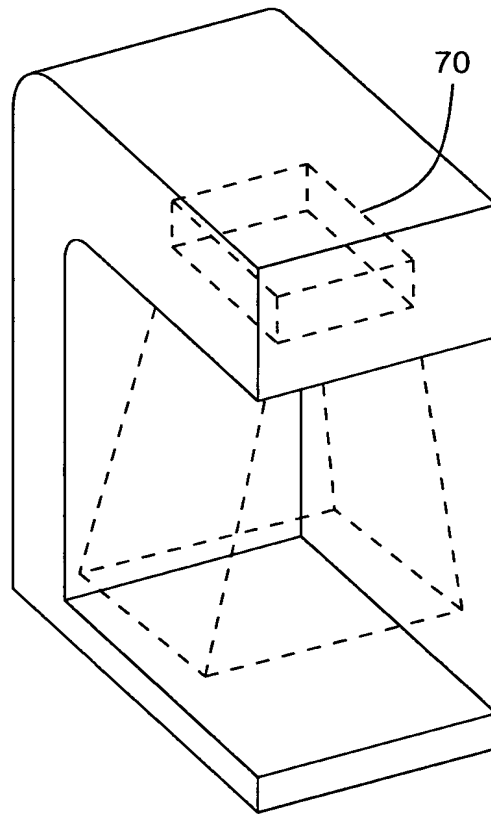


FIG. 5D

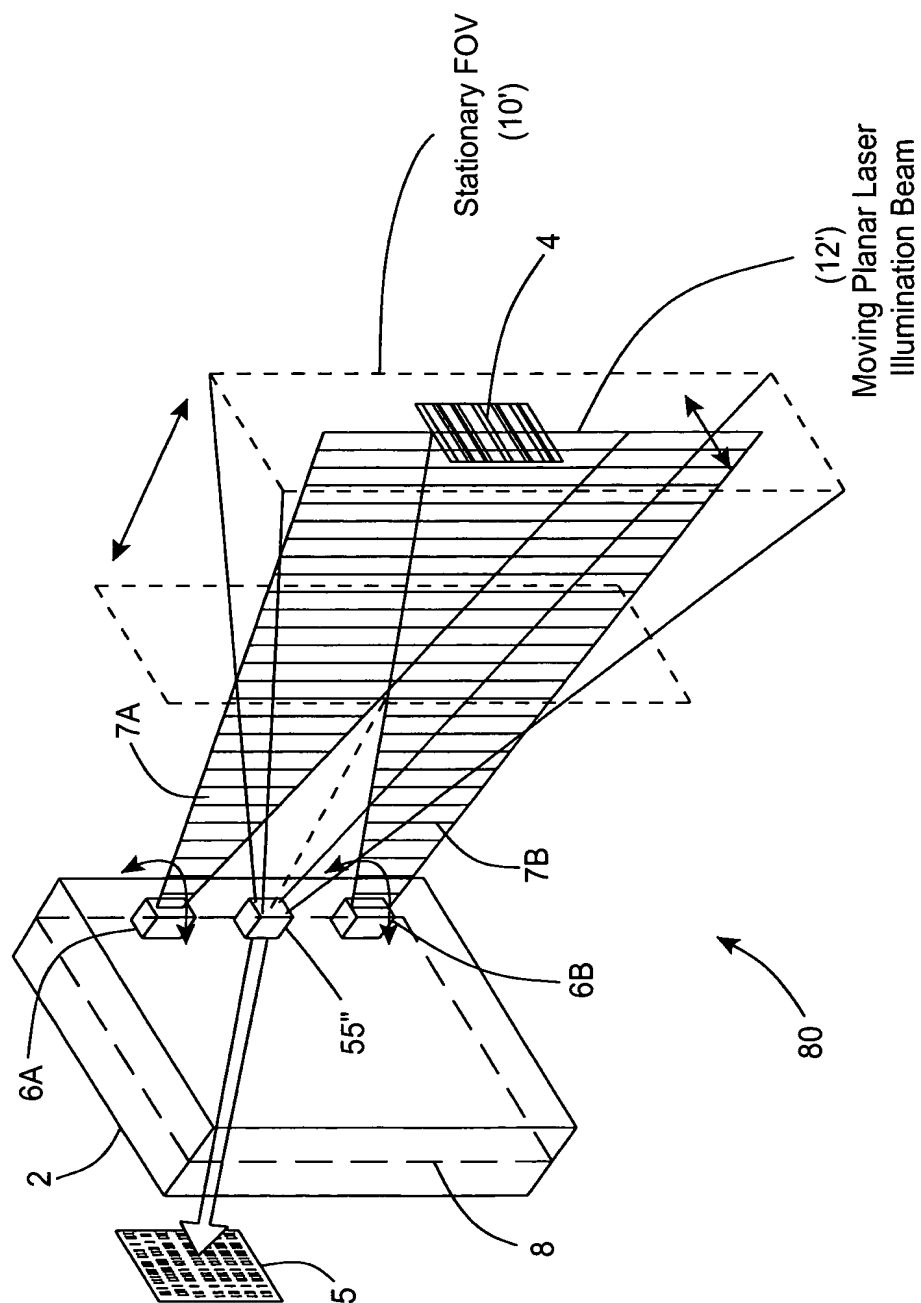


FIG. 6A

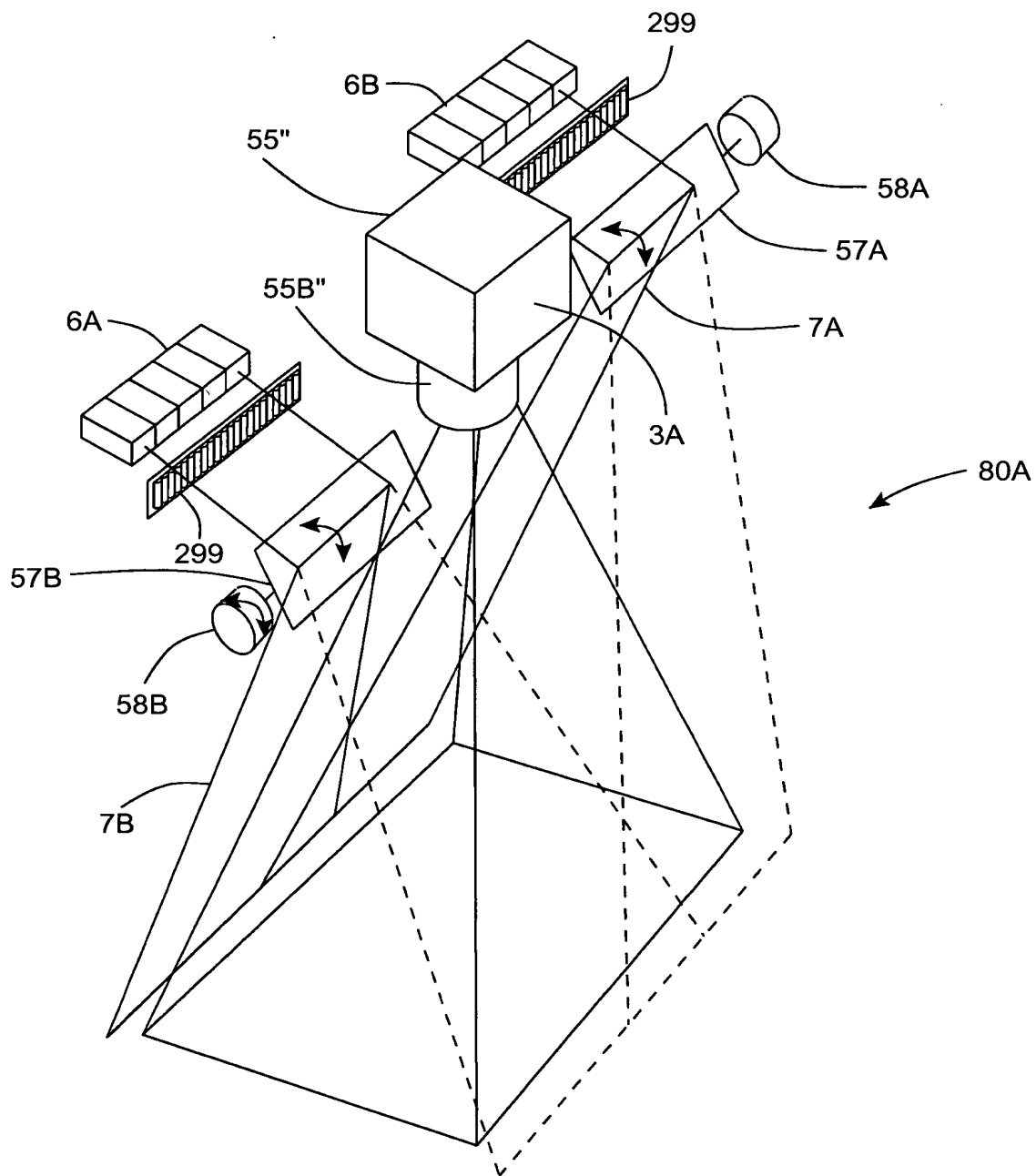


FIG. 6B1

FIG. 6B2

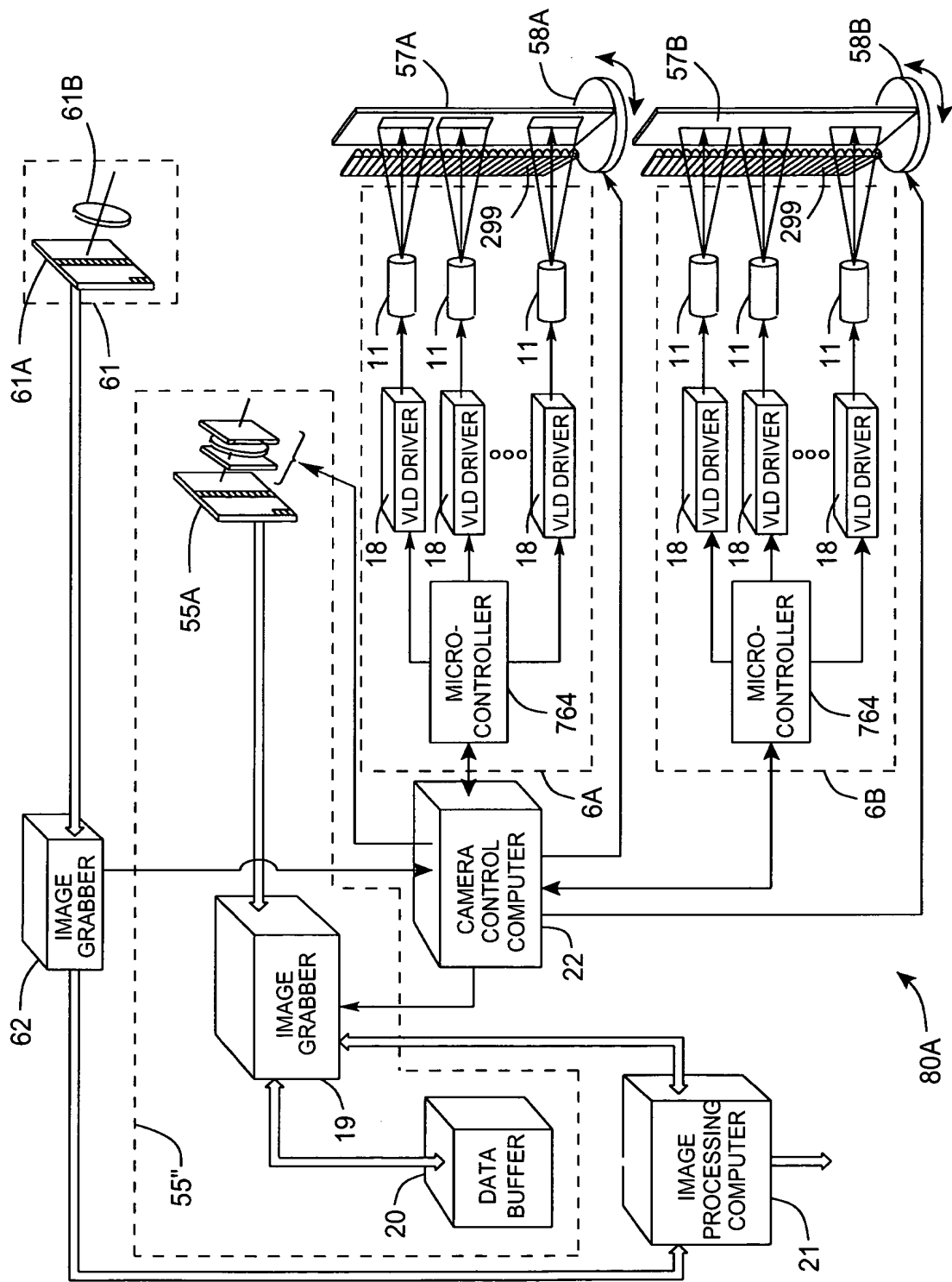


FIG. 6B3

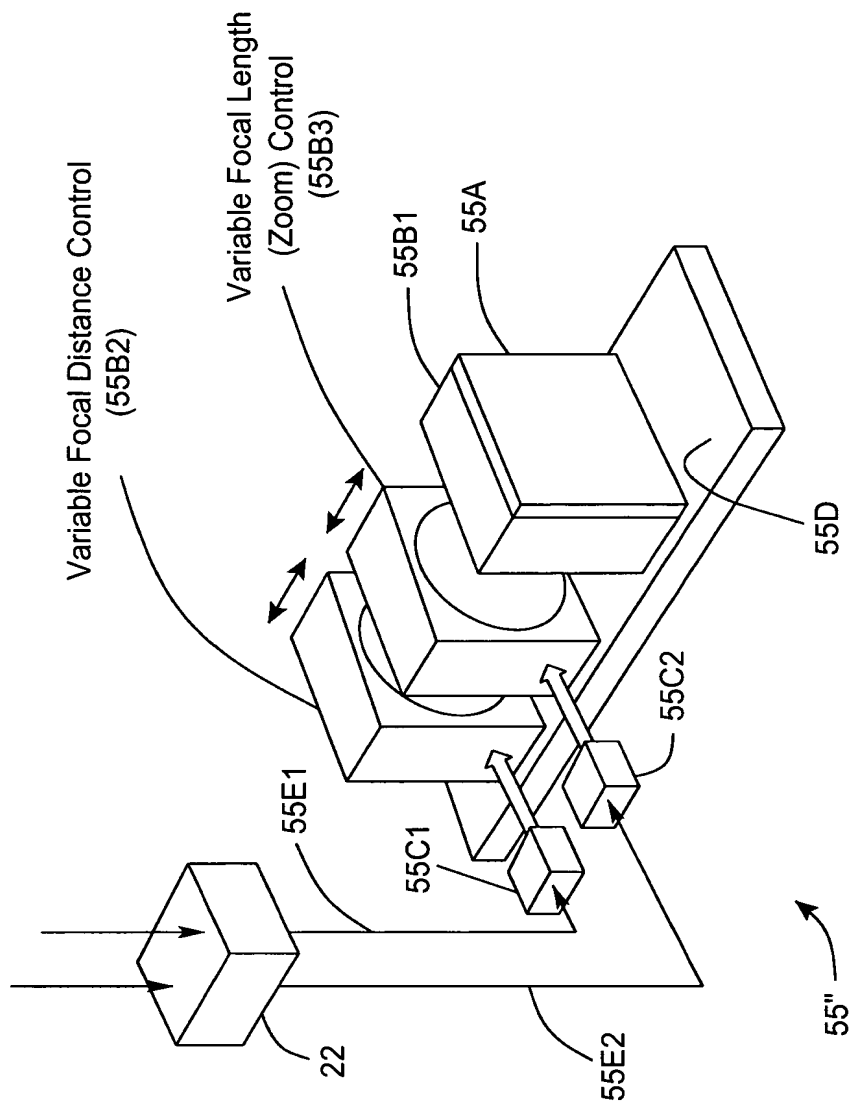


FIG. 6B4

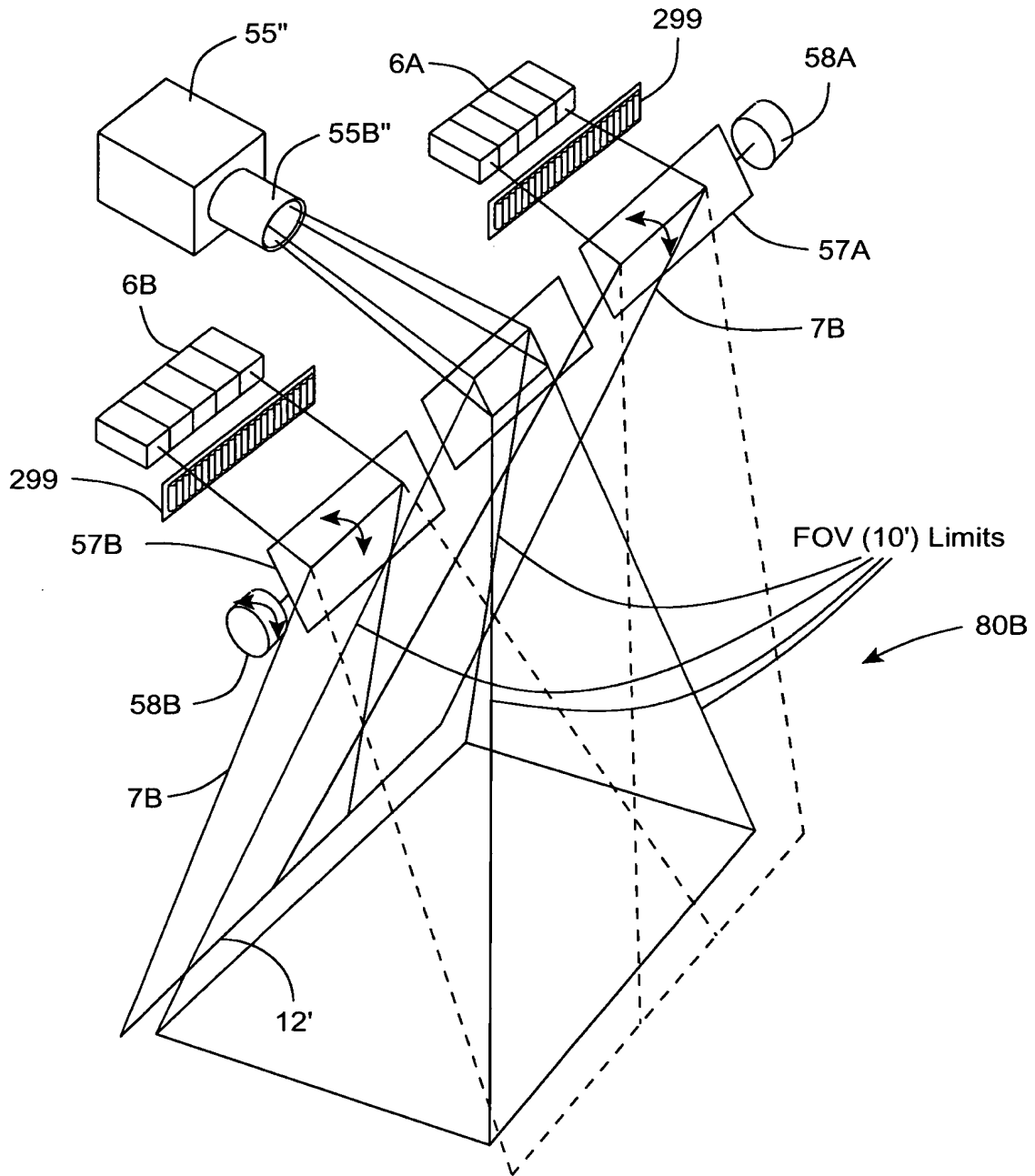
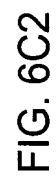


FIG. 6C1



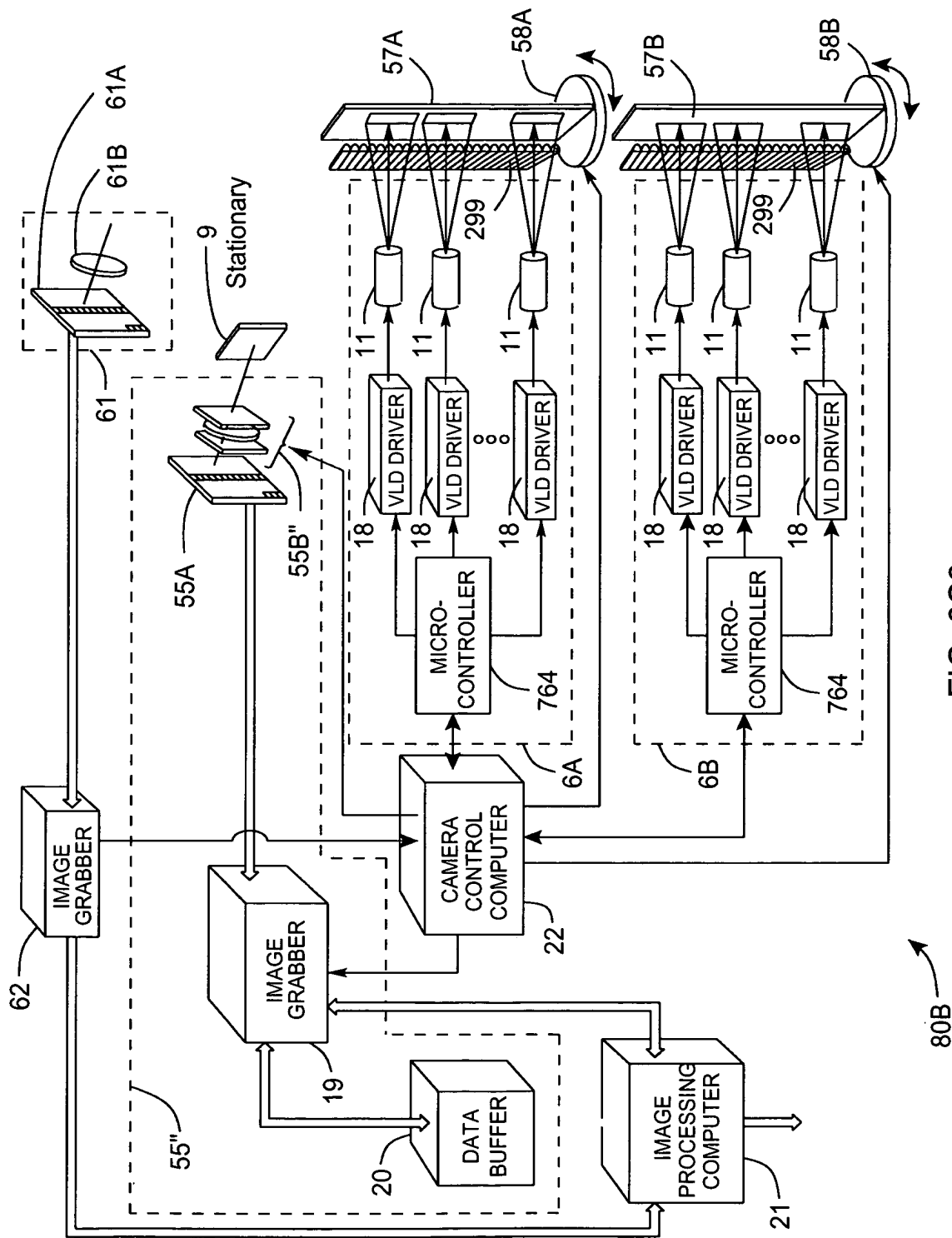


FIG. 6C3

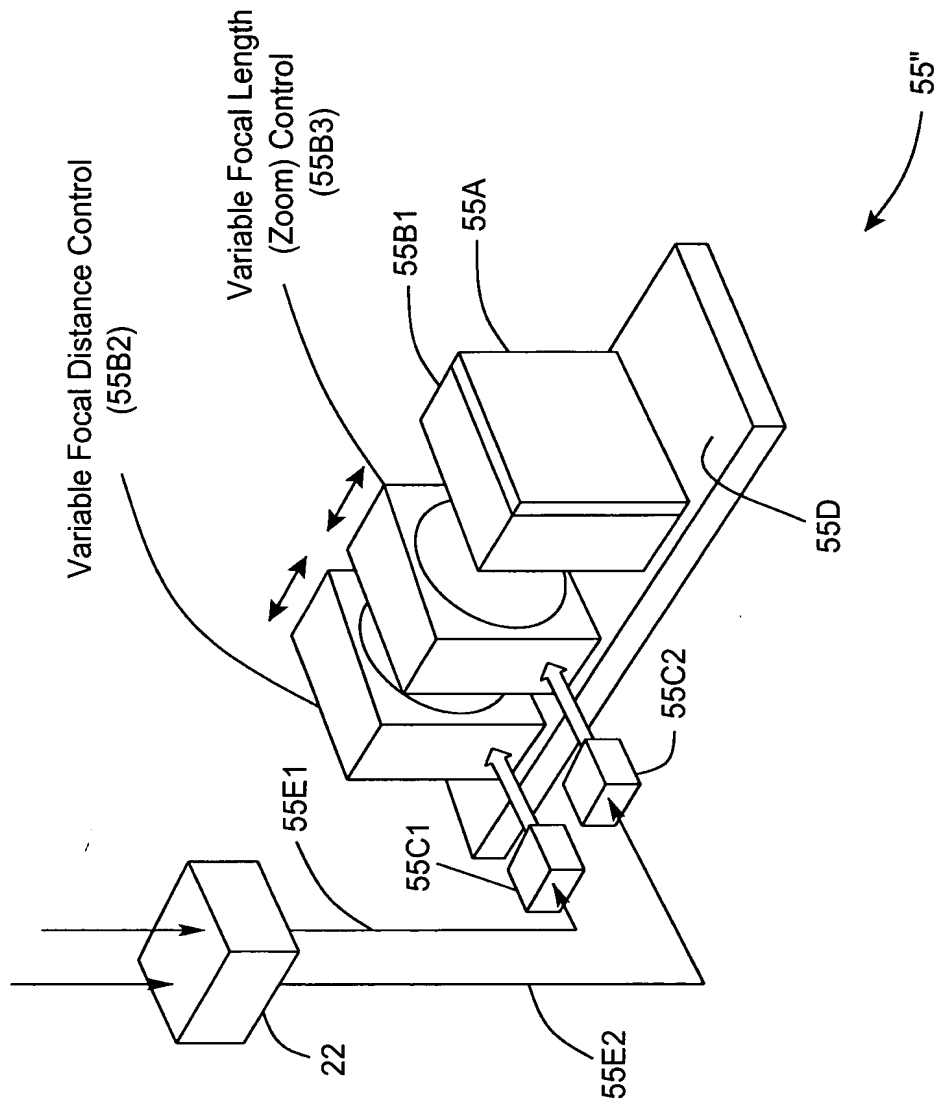


FIG. 6C4

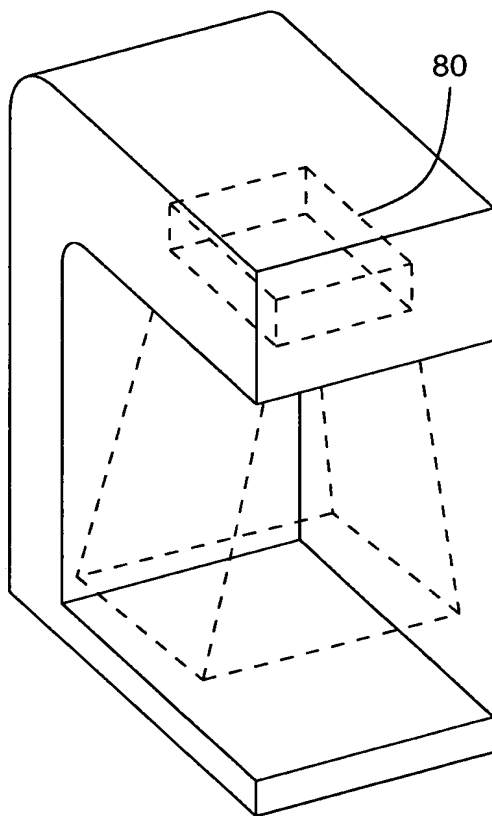


FIG. 6C5

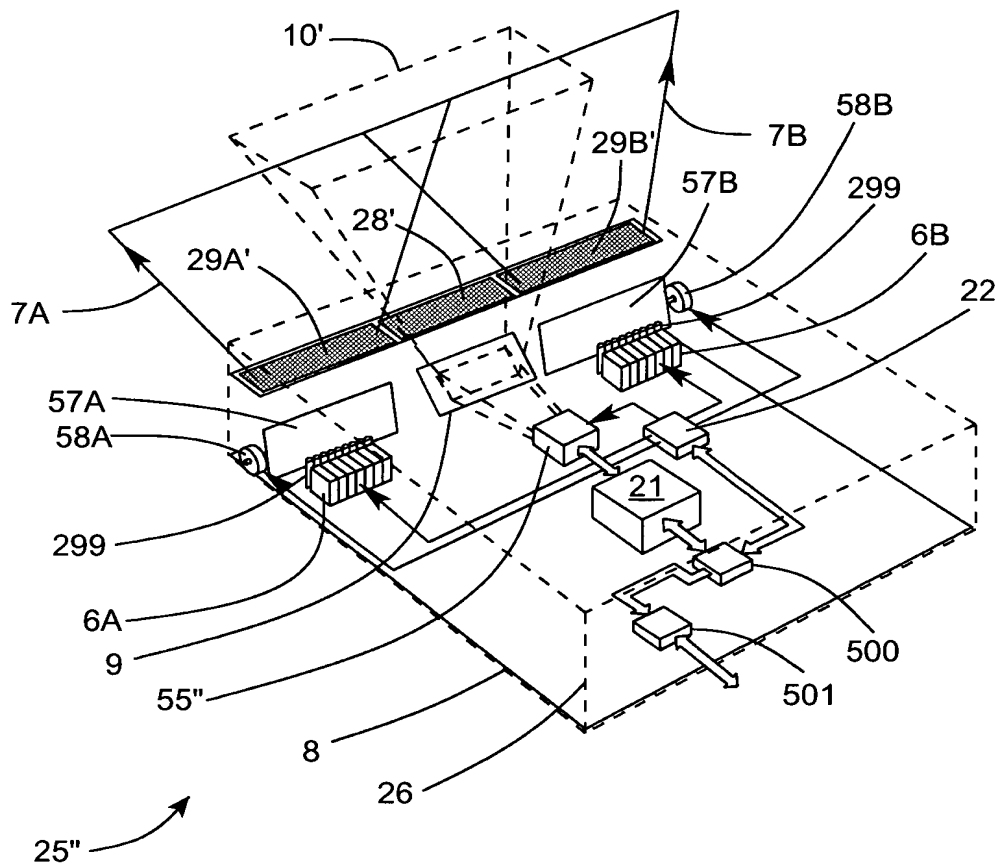


FIG. 6D1

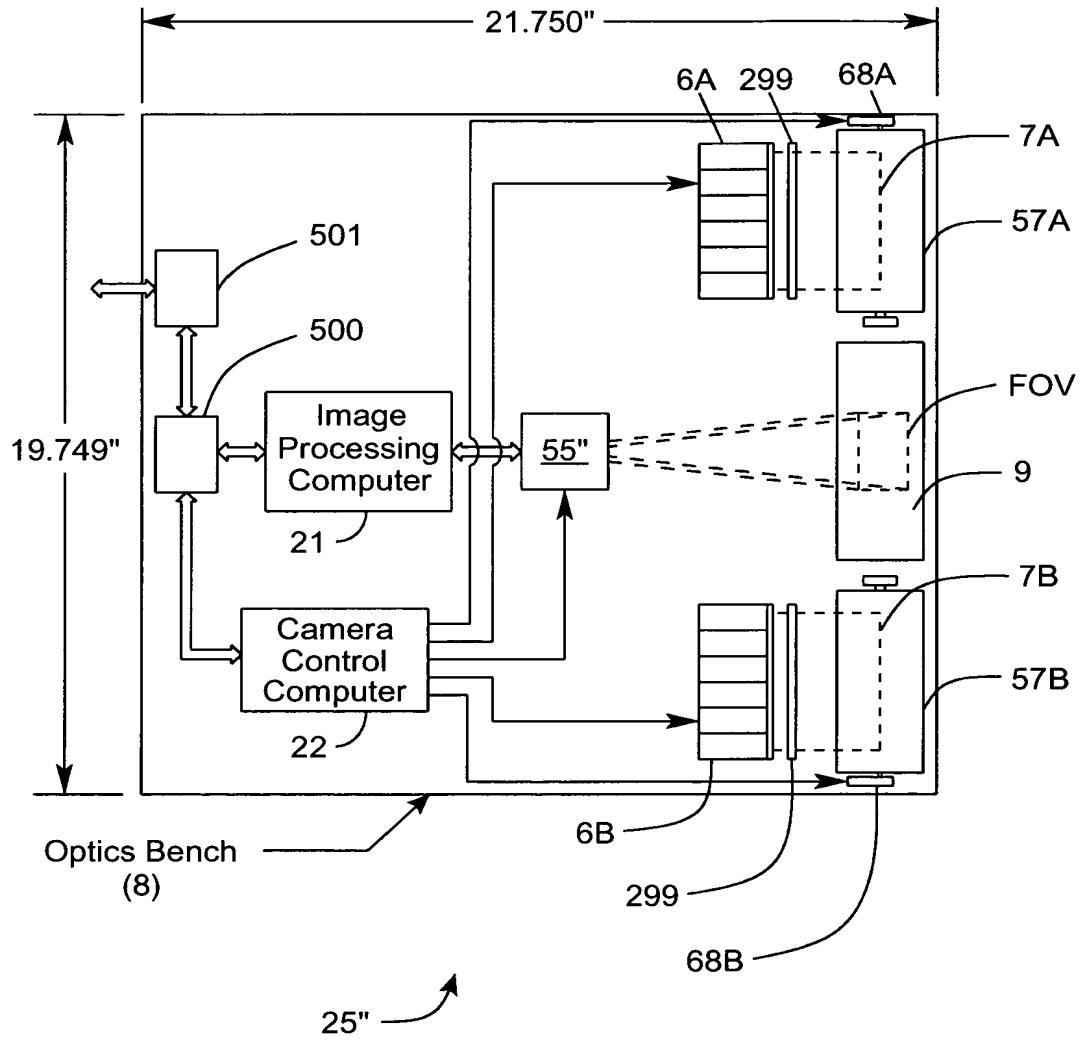


FIG. 6D2

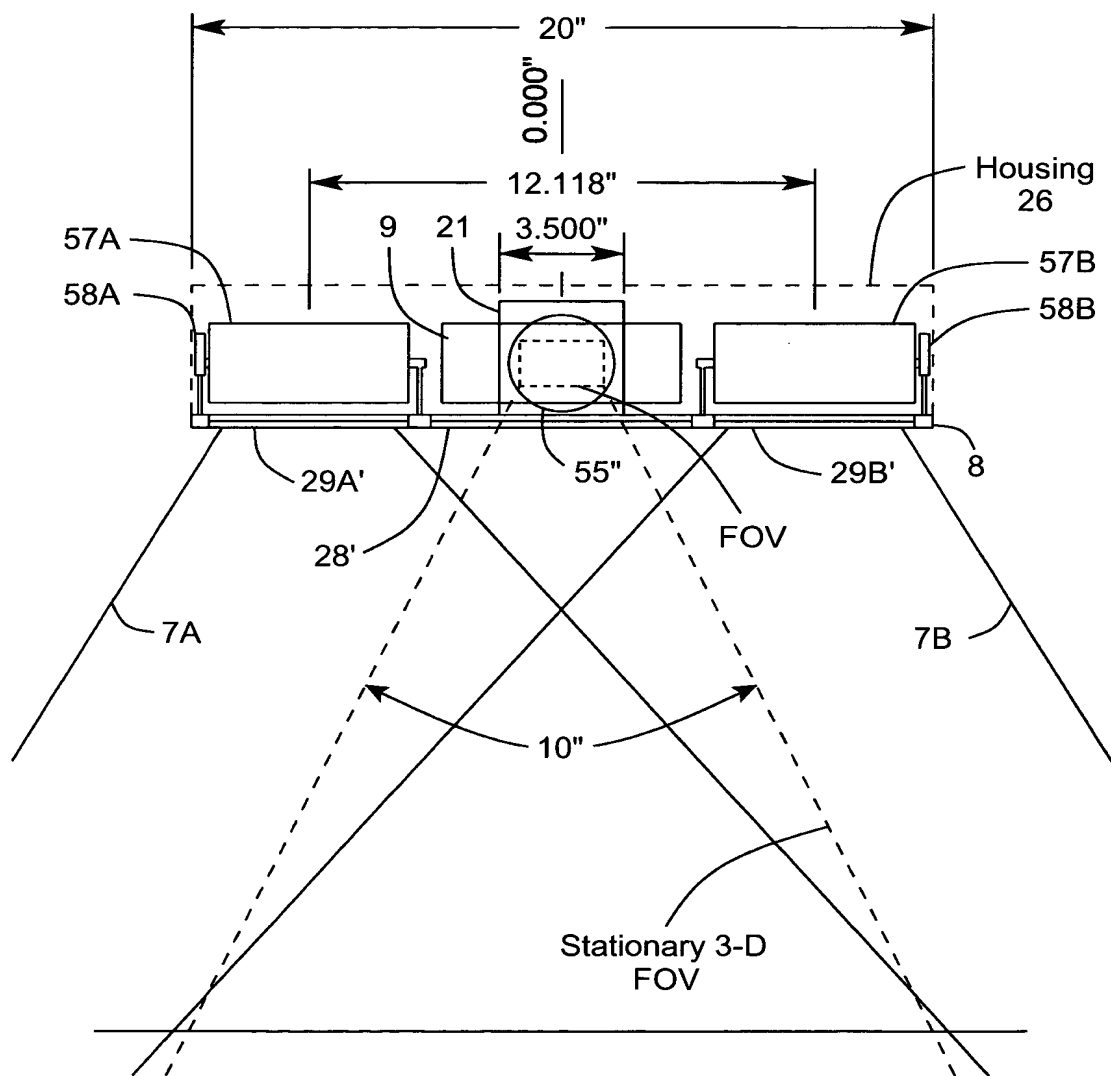


FIG. 6D3

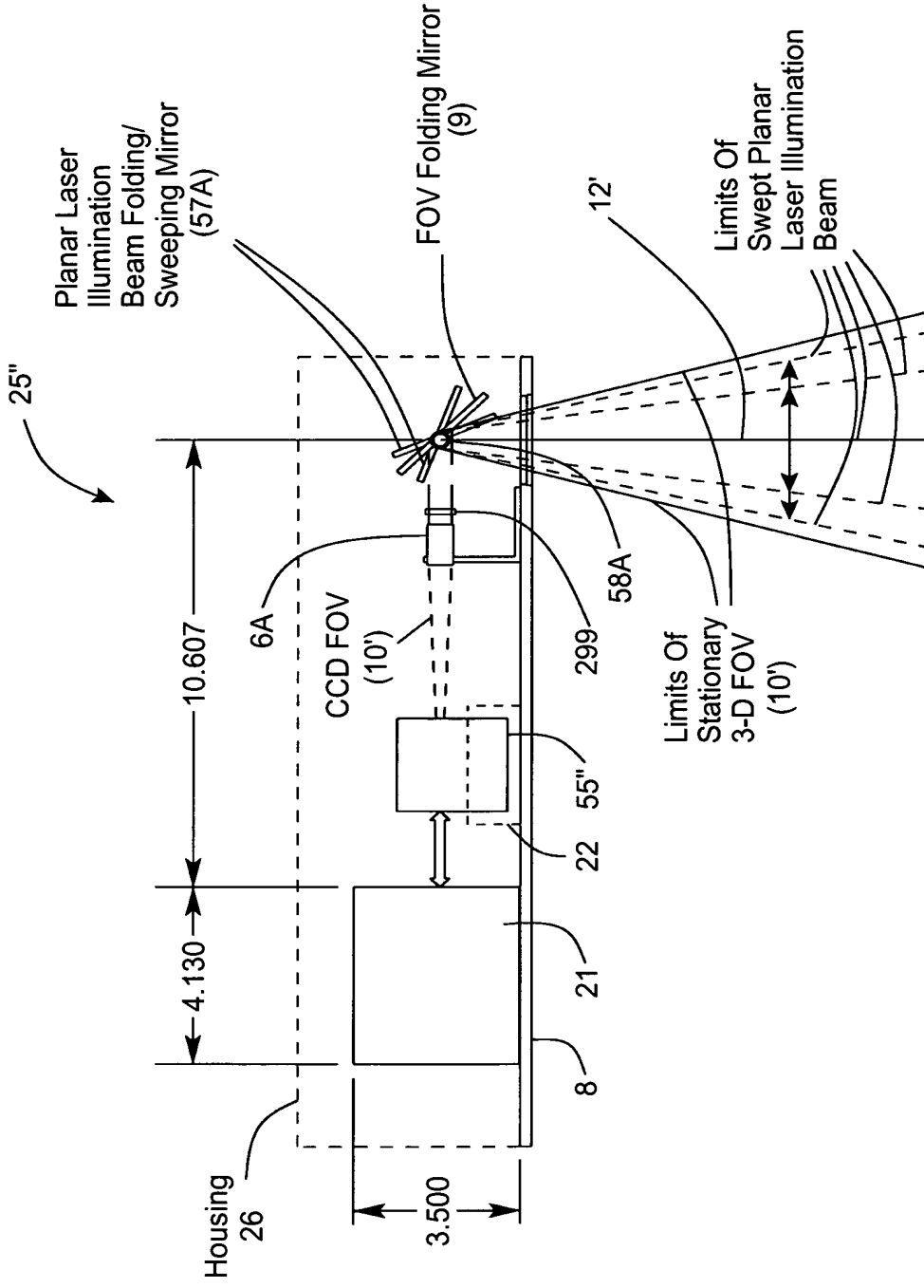


FIG. 6D4



* Variable FOV

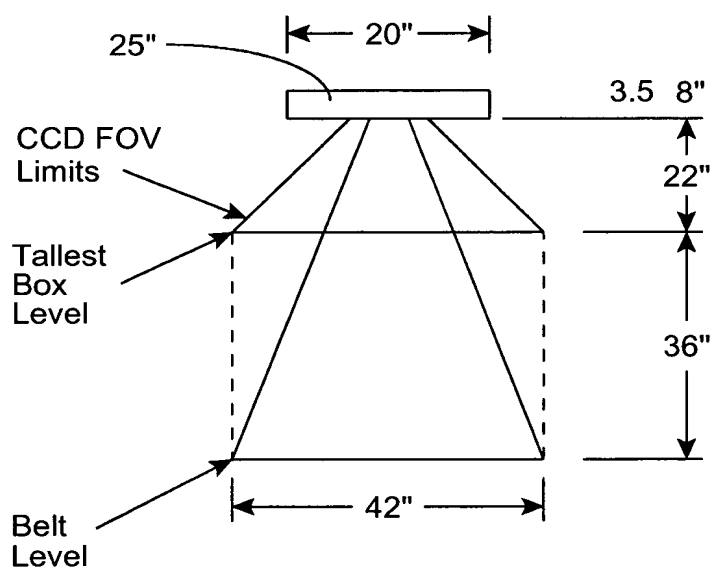


FIG. 6D5

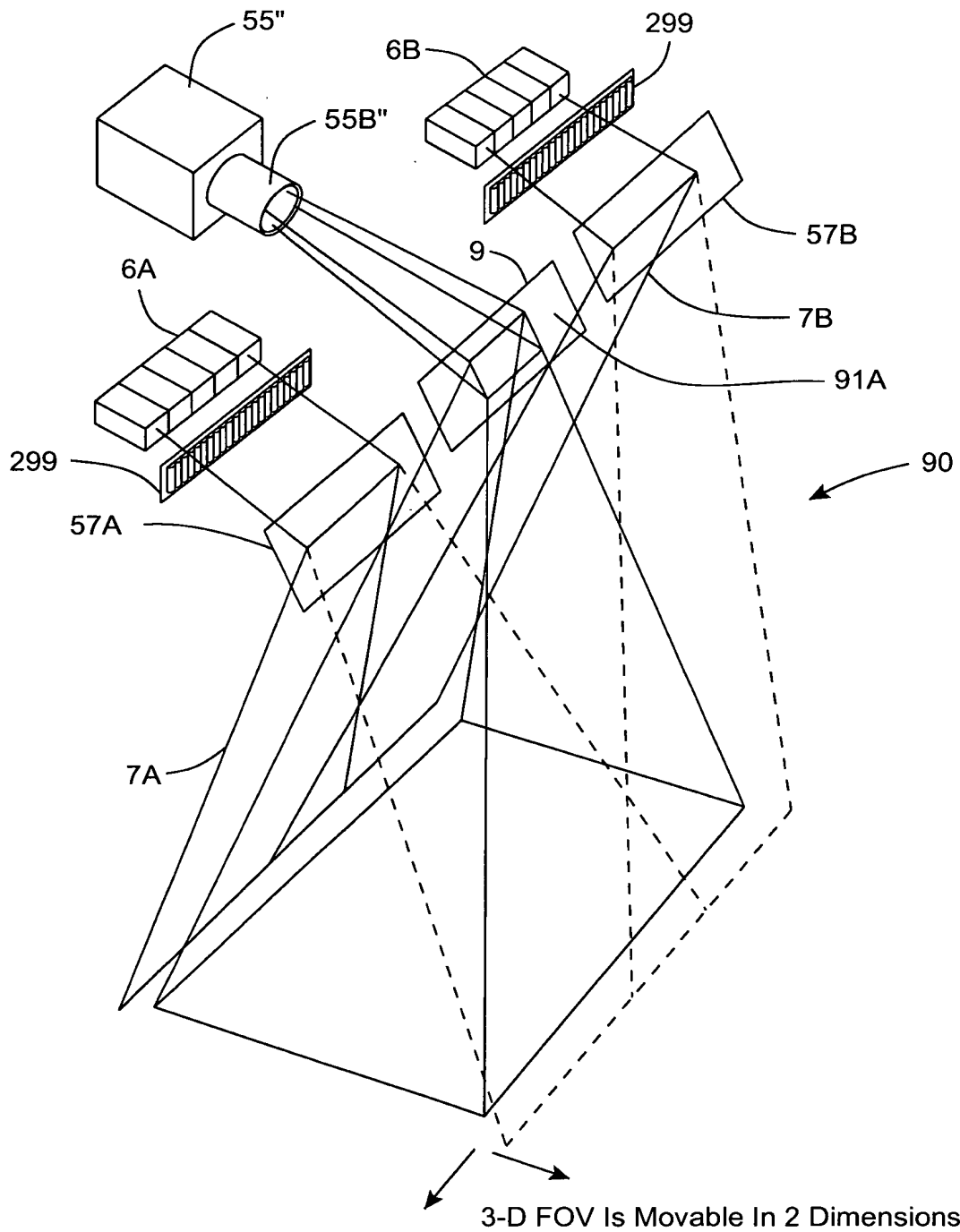


FIG. 6E1

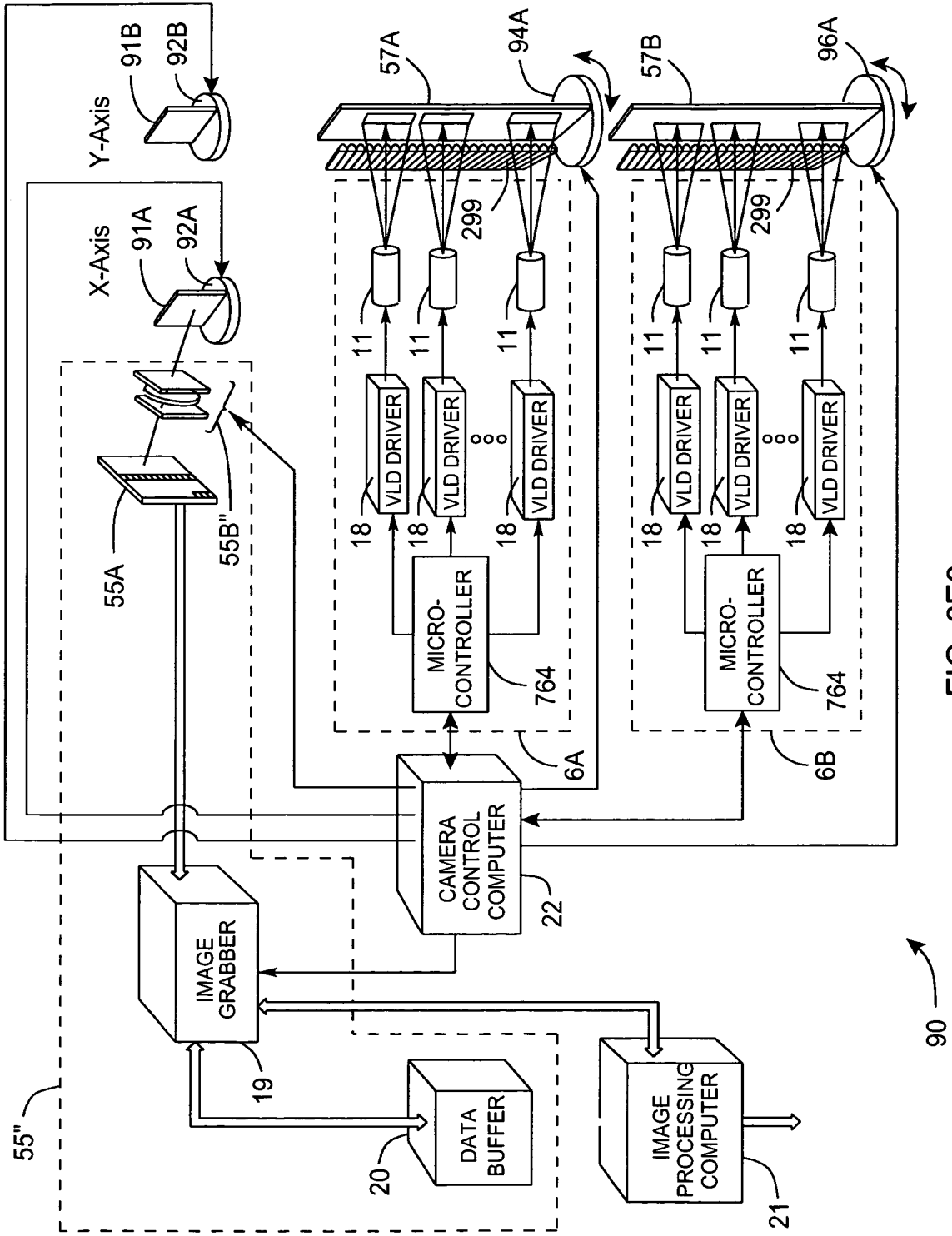


FIG. 6E3

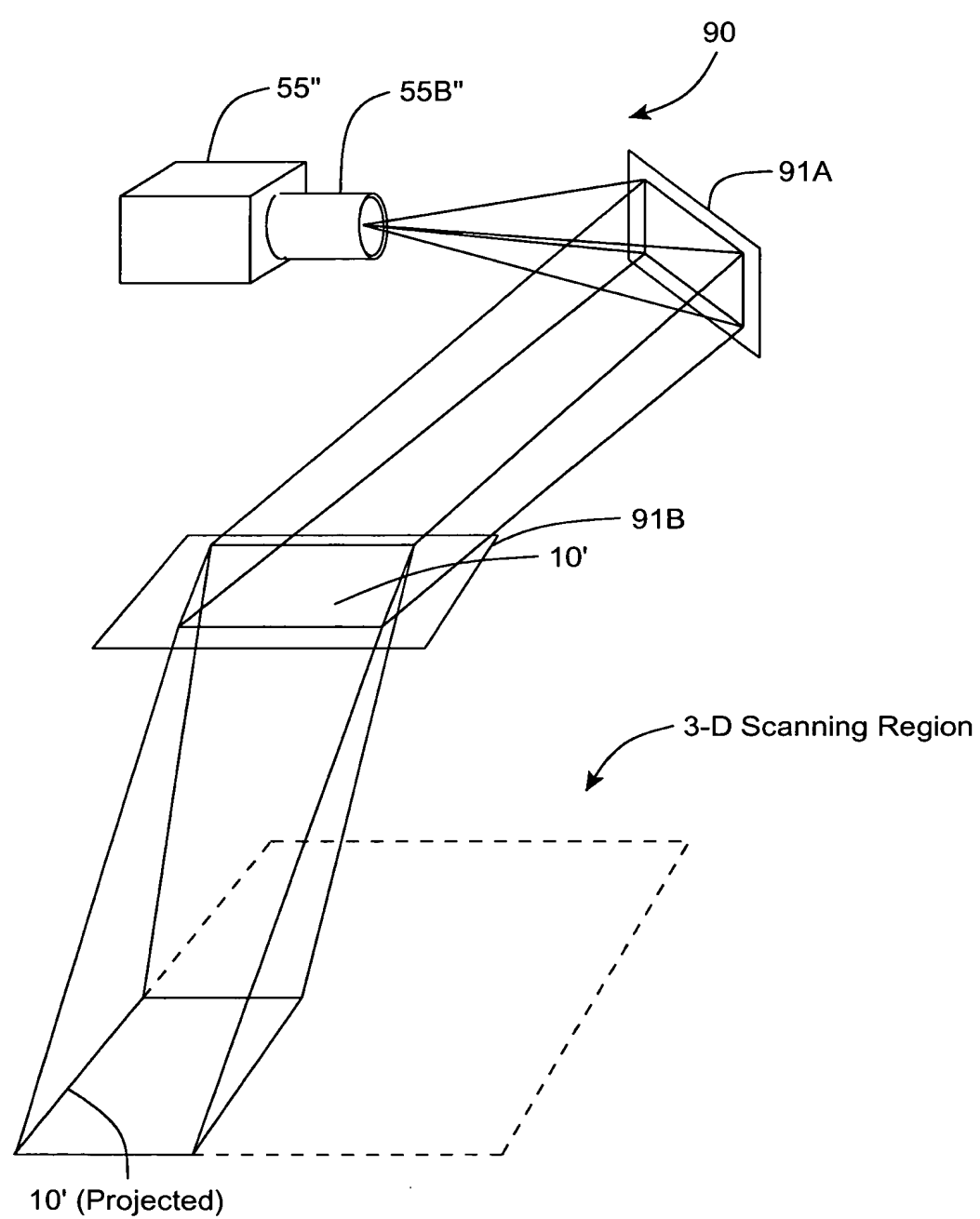


FIG. 6E4

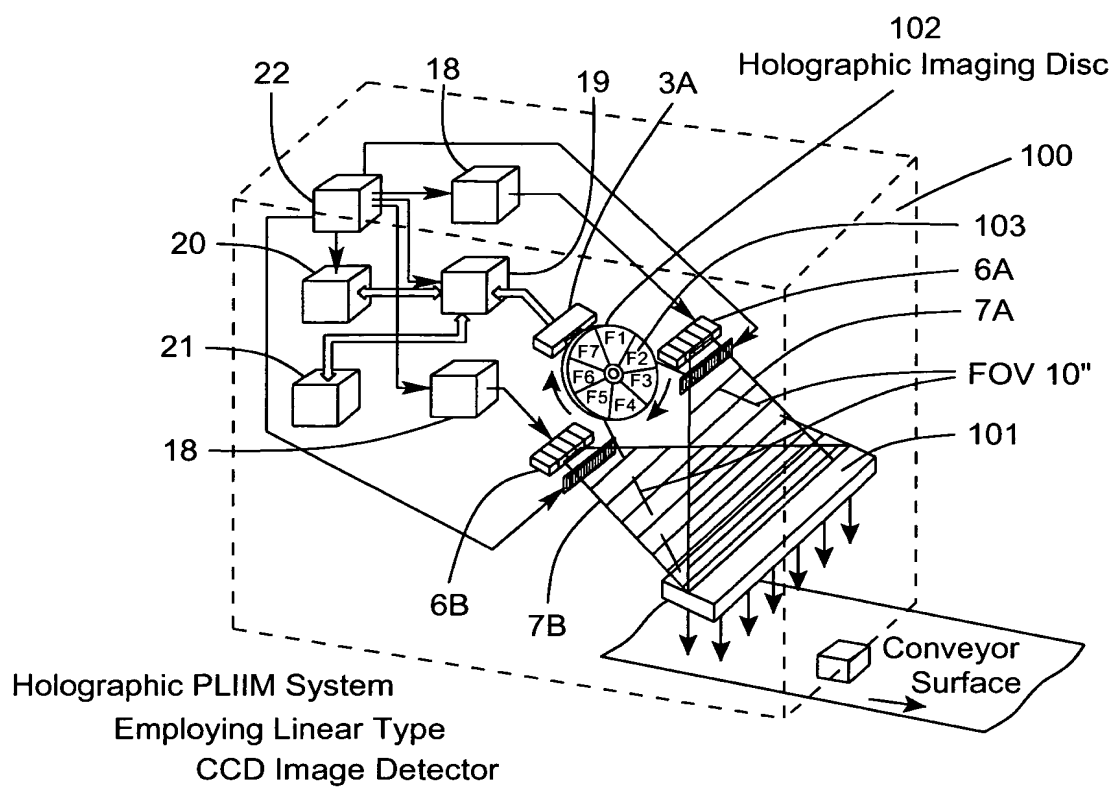


FIG. 7A

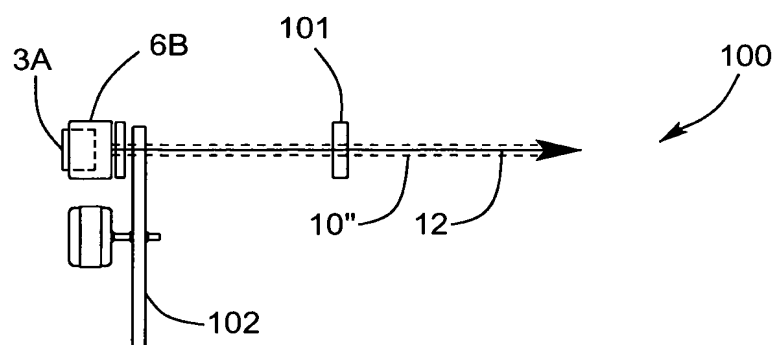


FIG. 7B

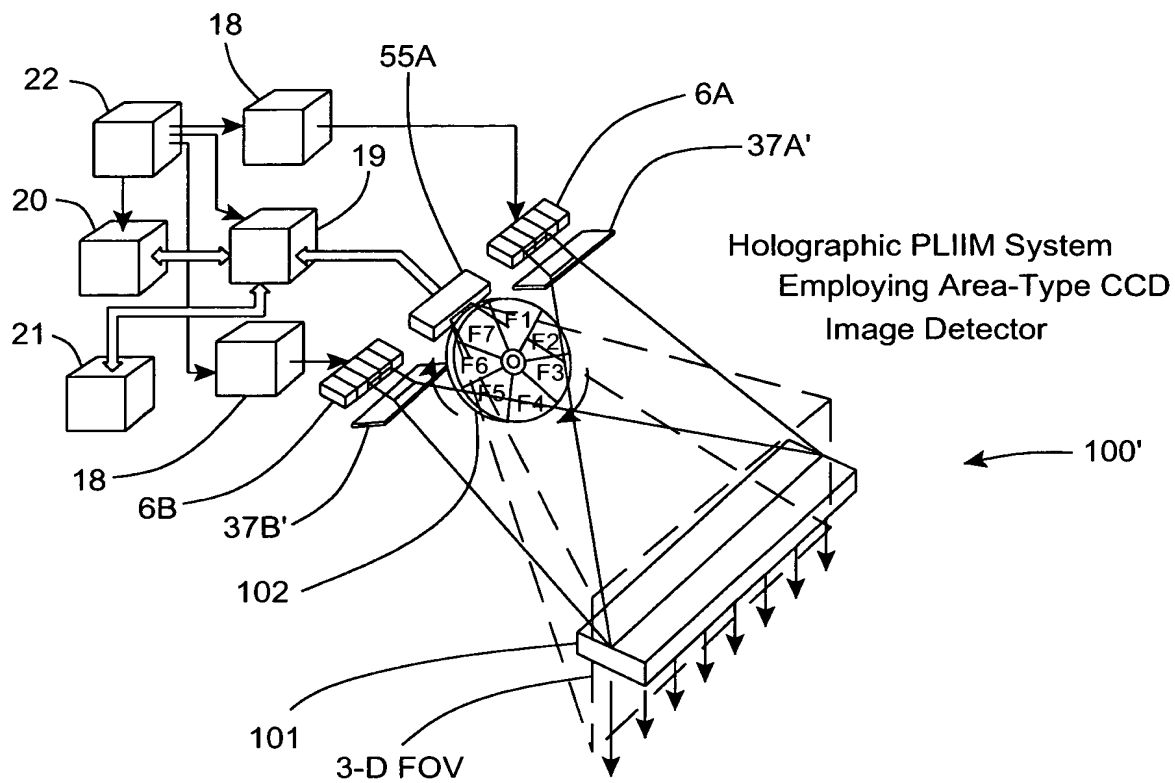


FIG. 8A

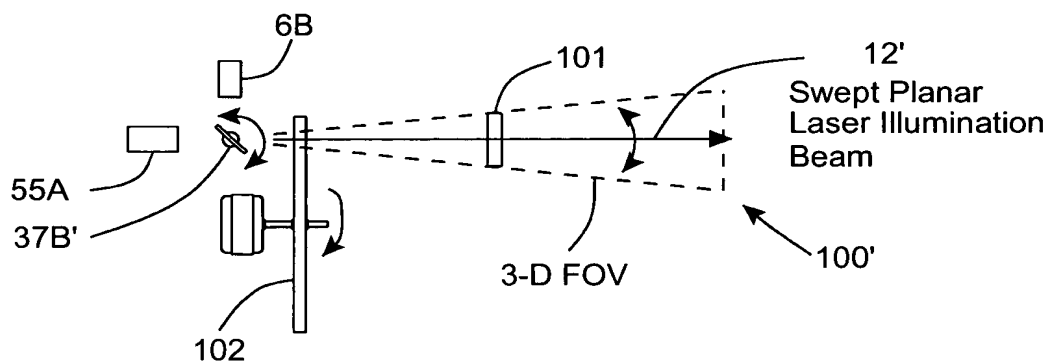


FIG. 8B

1-D Scanner Embodiment

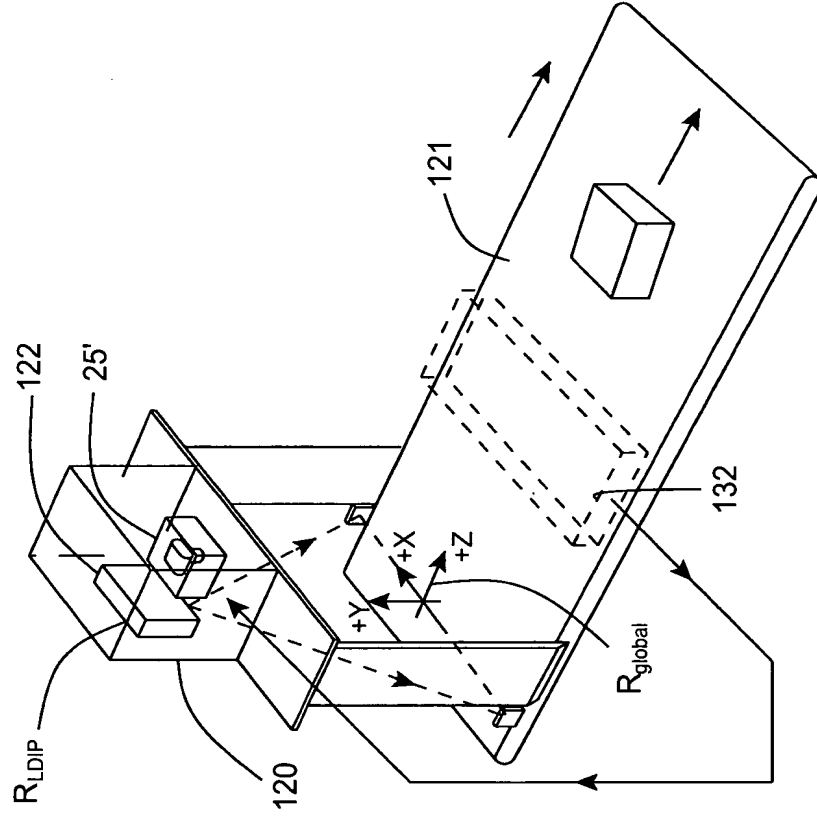


FIG. 9

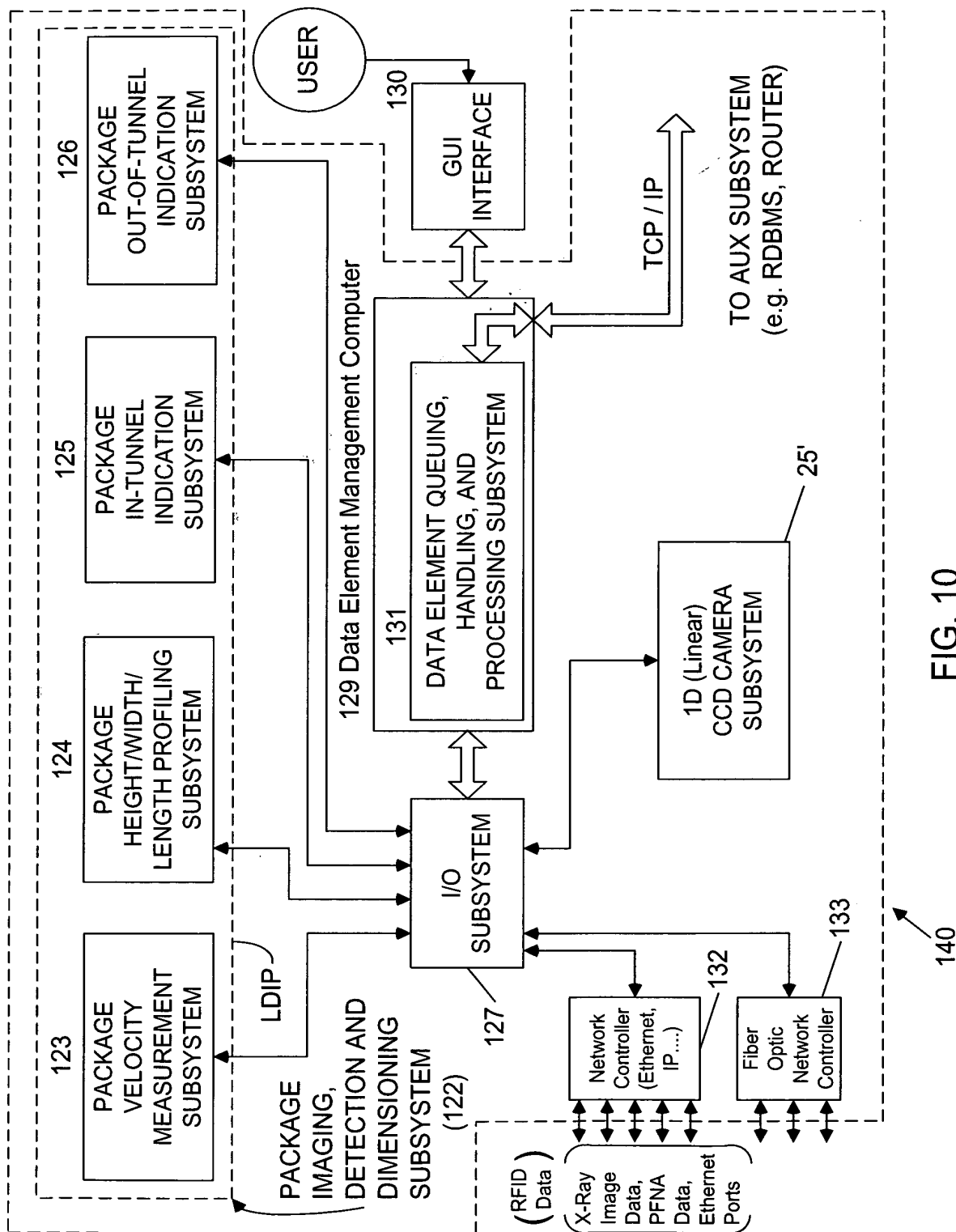


FIG. 10

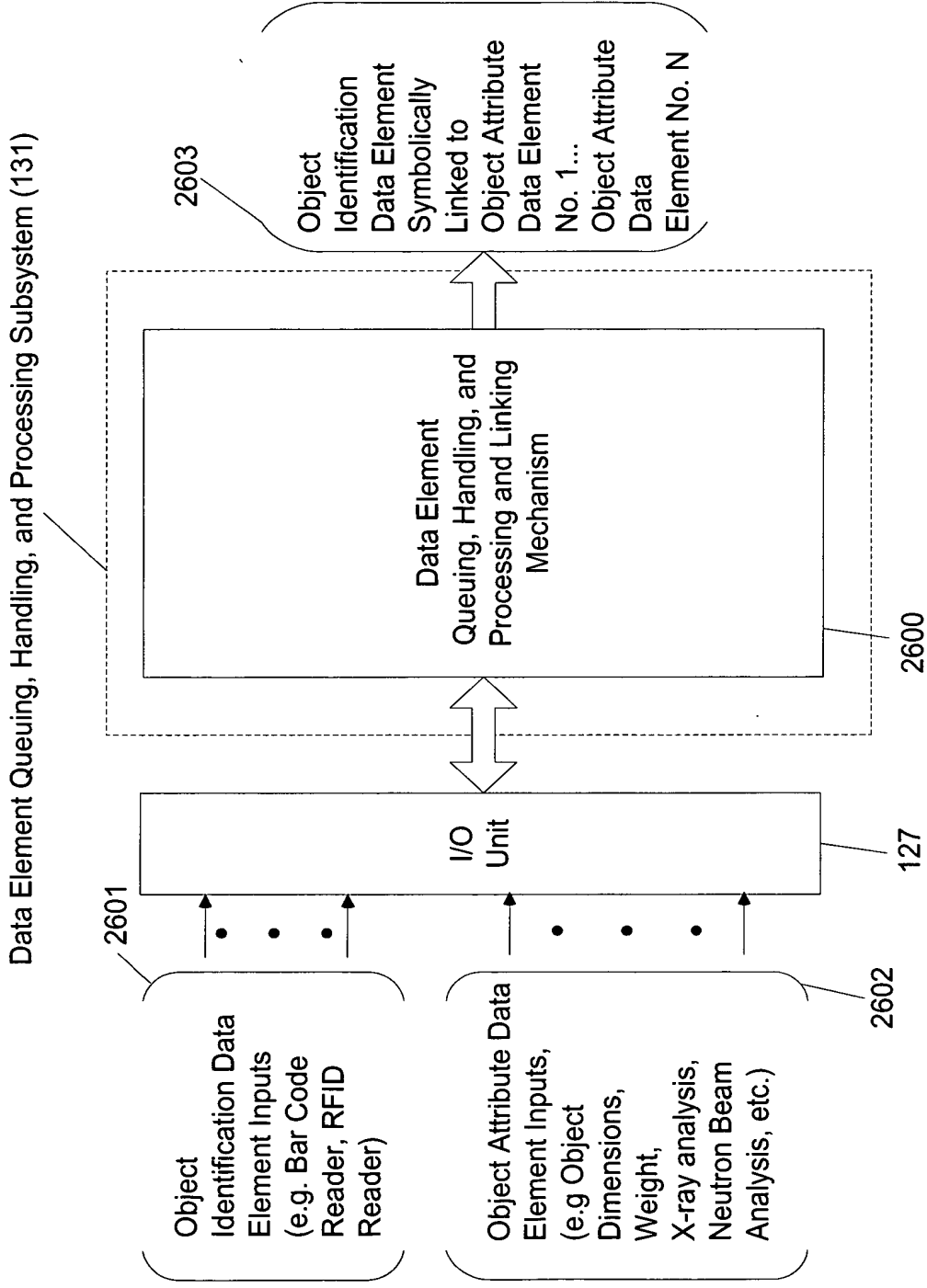
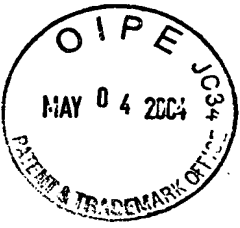


FIG. 10A

Specification of Object Detection, Tracking, and Identification and Attribute-Acquisition Capabilities of a Configured System or Network.

Primary Network and/ or System Functions:	
A. Specification of Object Detection and Tracking Capability of System	
B. Specification of Object Identification Capability of System	
C. Specification of Object Attribute Acquisition Capability of System	

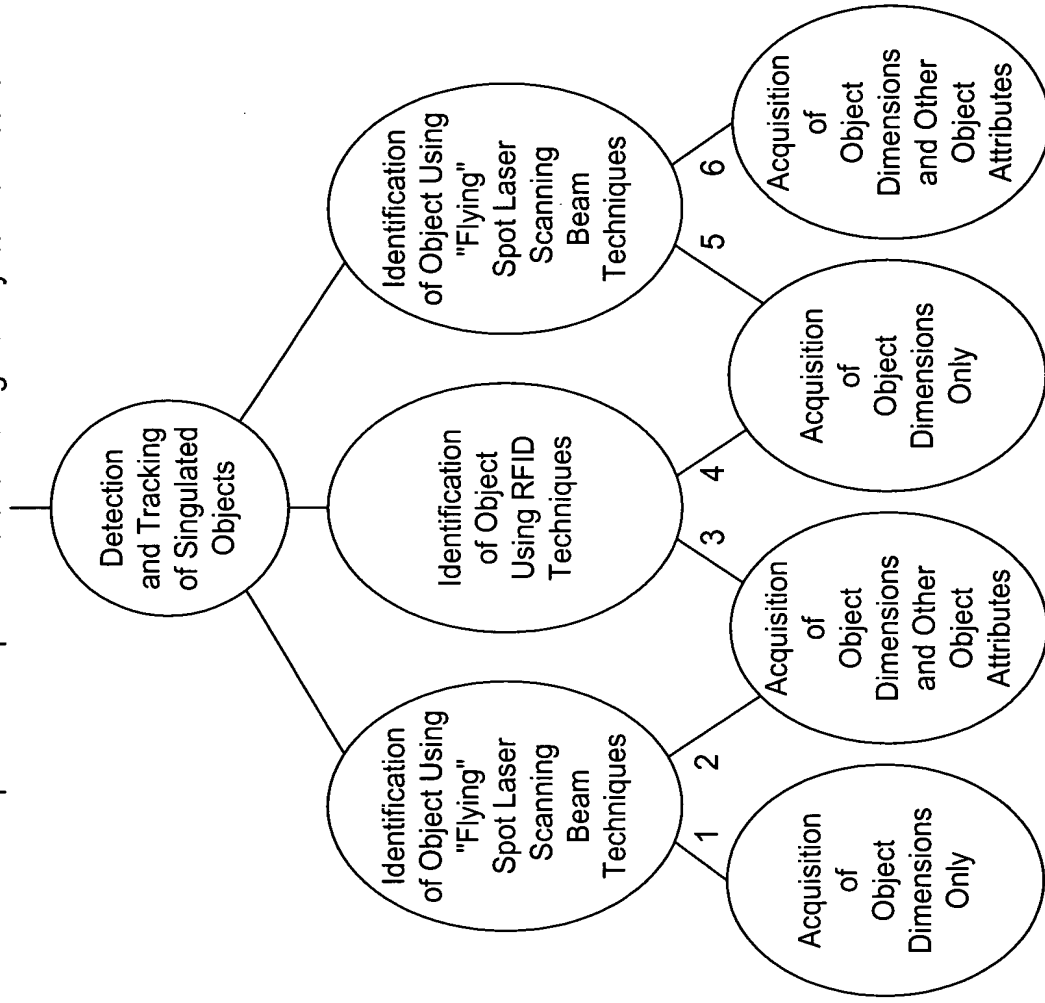


FIG. 10B-1

Specification of Object Detection, Tracking, and Identification and Attribute-Acquisition Capabilities of a Configured System or Network.

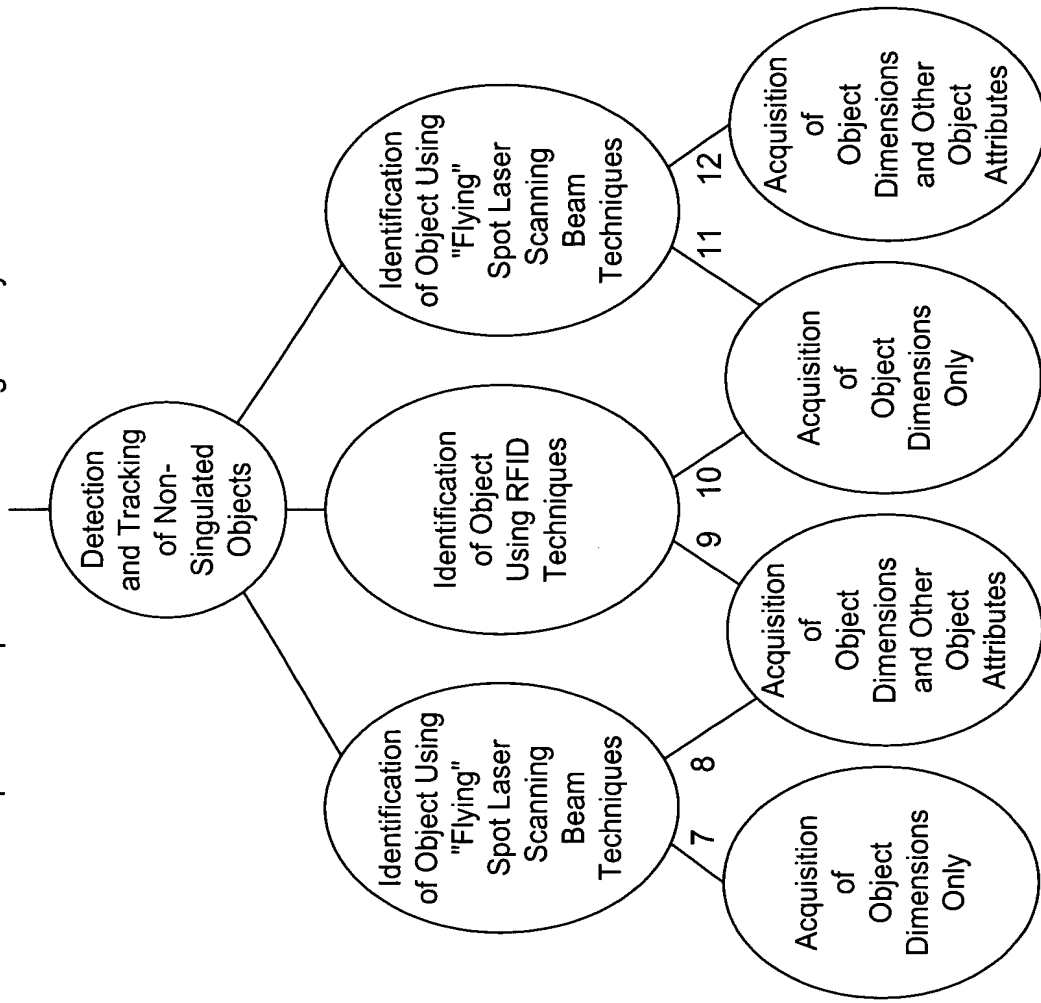


FIG. 10B-2

Primary Network and/ or System Functions:

A. Specification of Object Detection and Tracking Capability of System

B. Specification of Object Identification Capability of System

C. Specification of Object Attribute Acquisition Capability of System

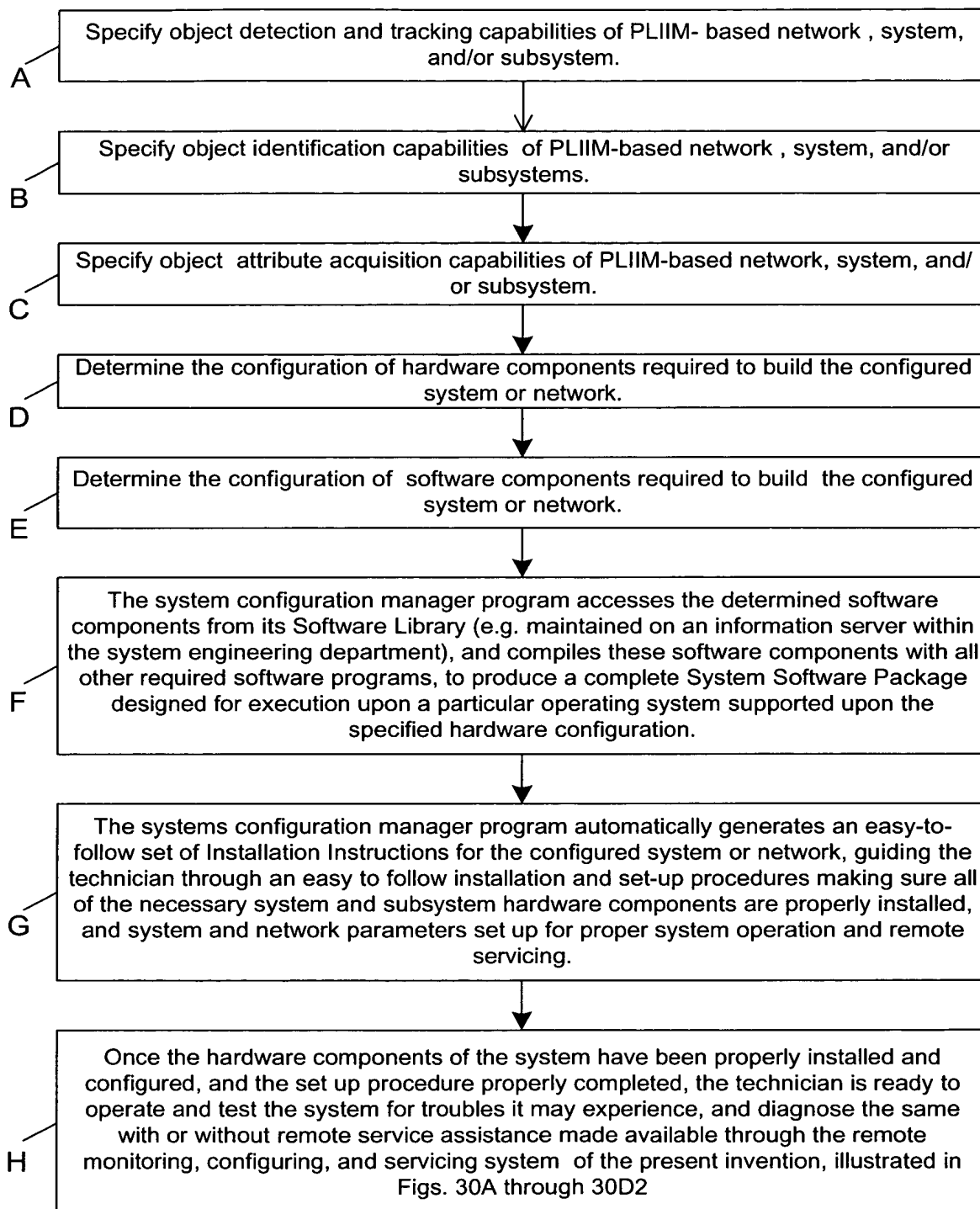


FIG. 10C

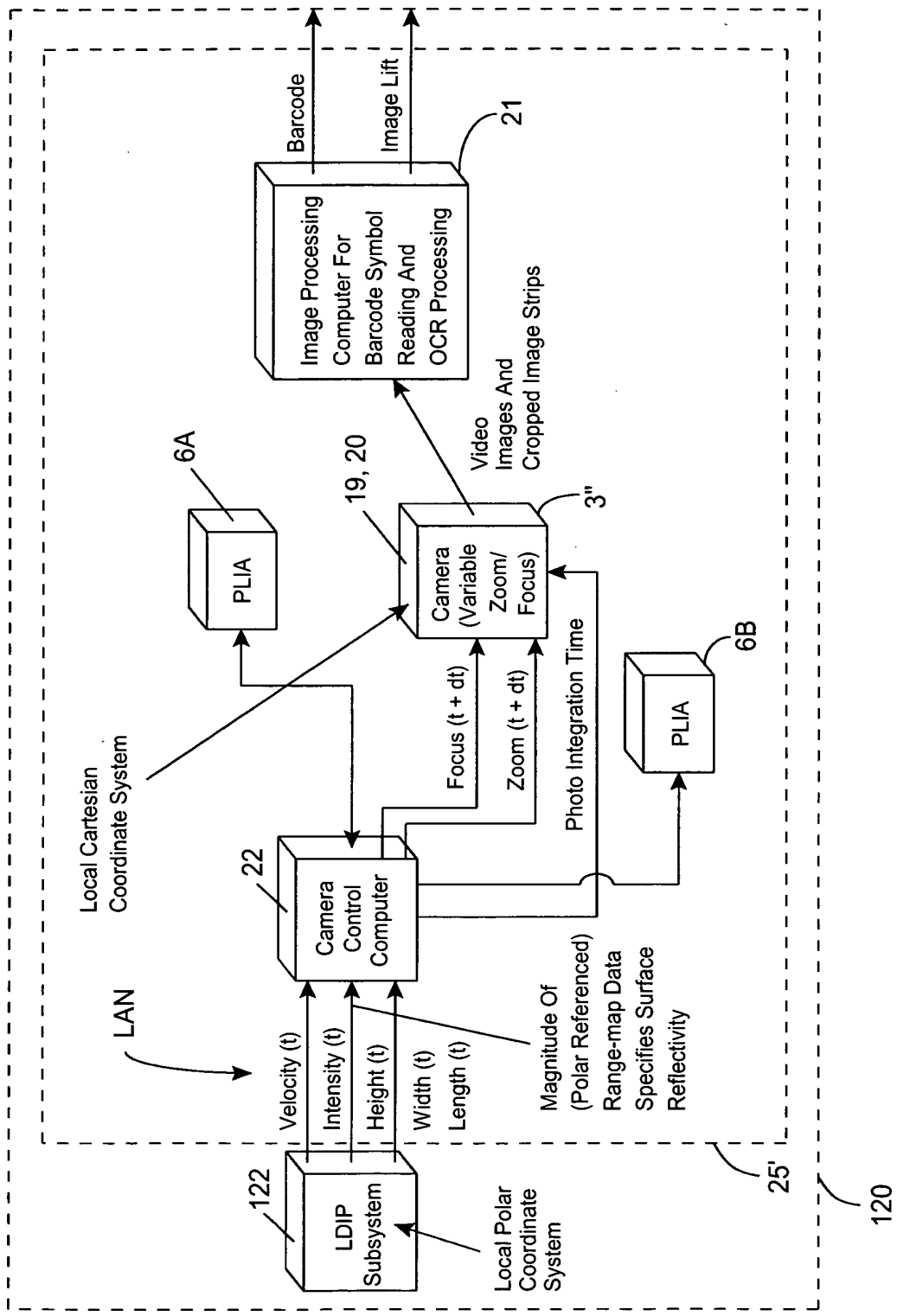


FIG. 11

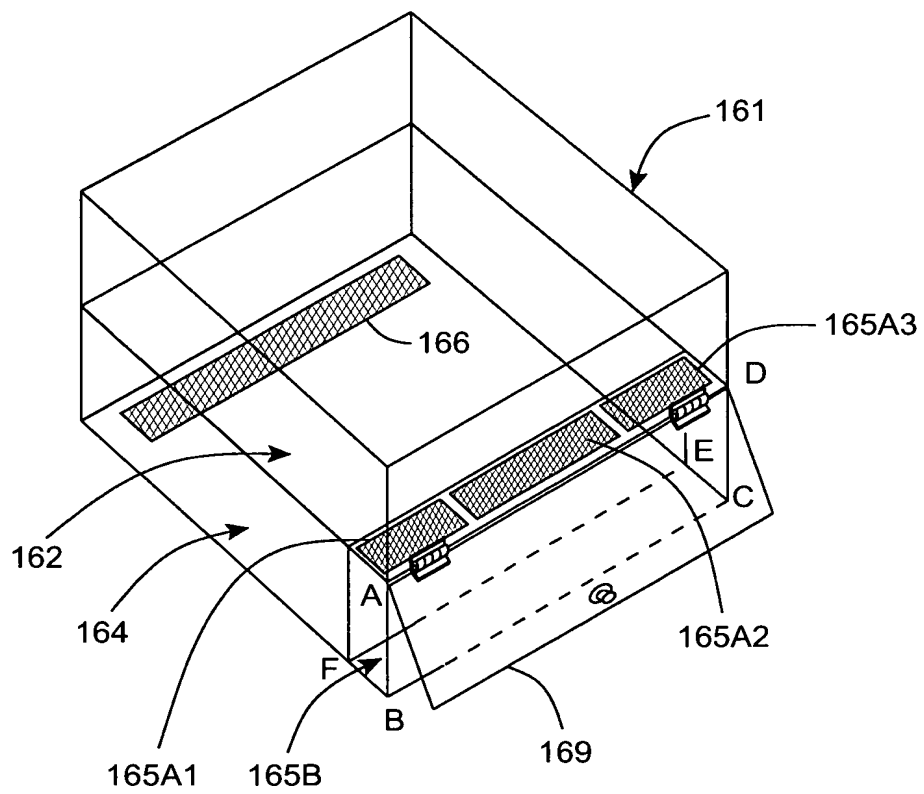


FIG. 12A

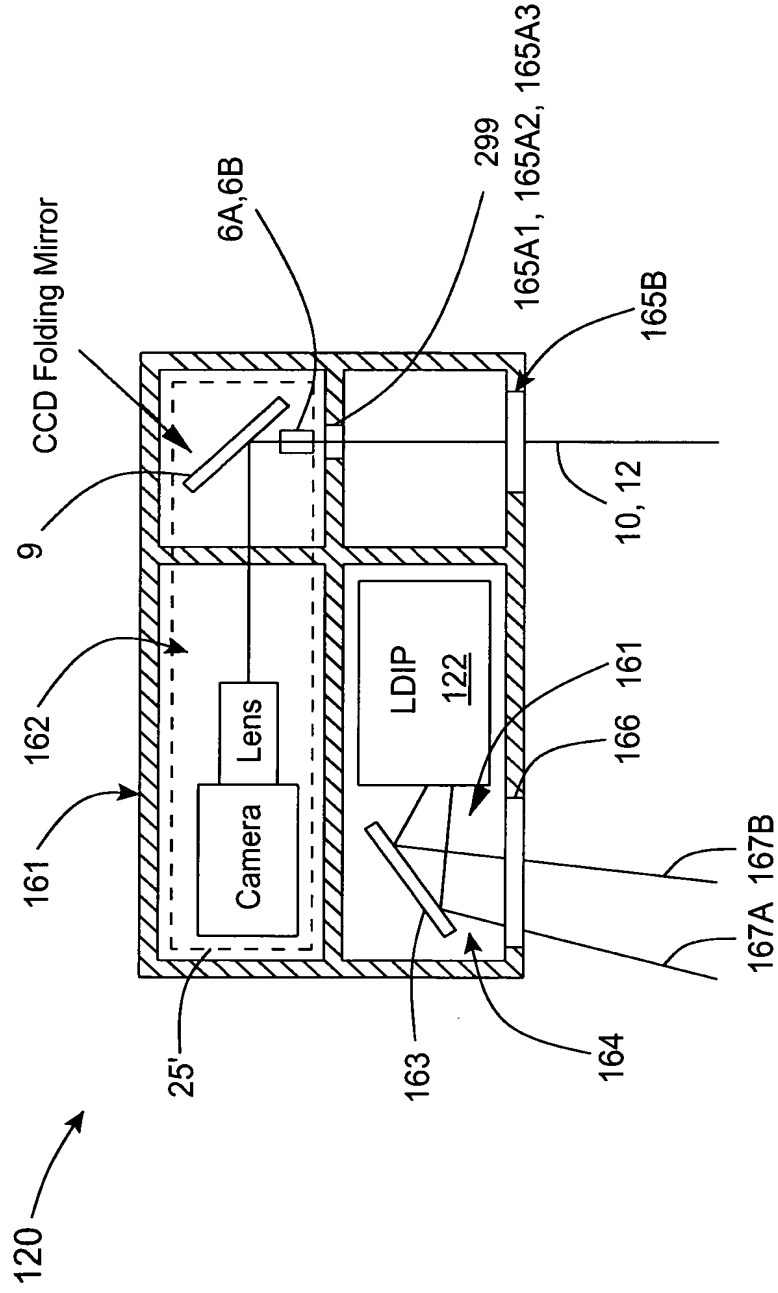


FIG. 12B

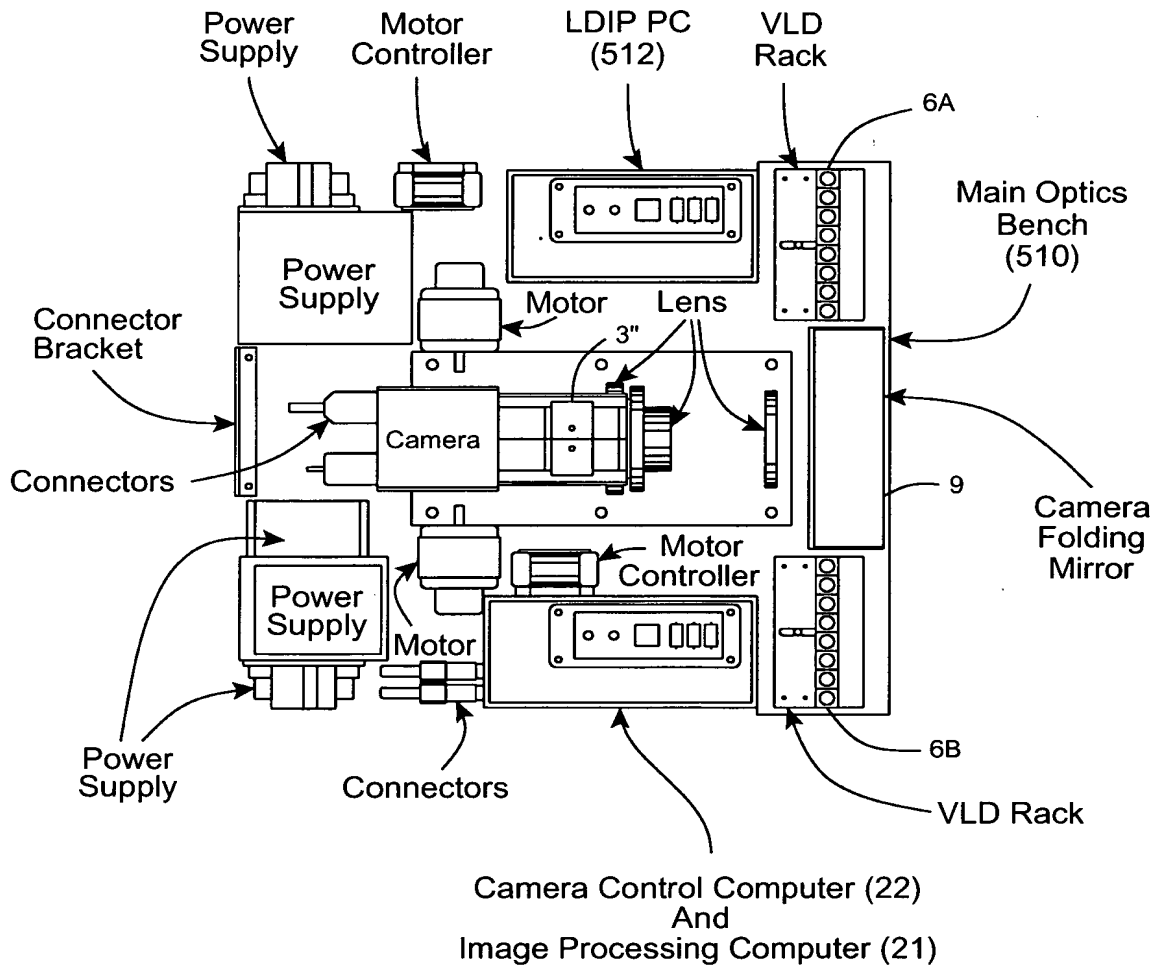


FIG. 12C

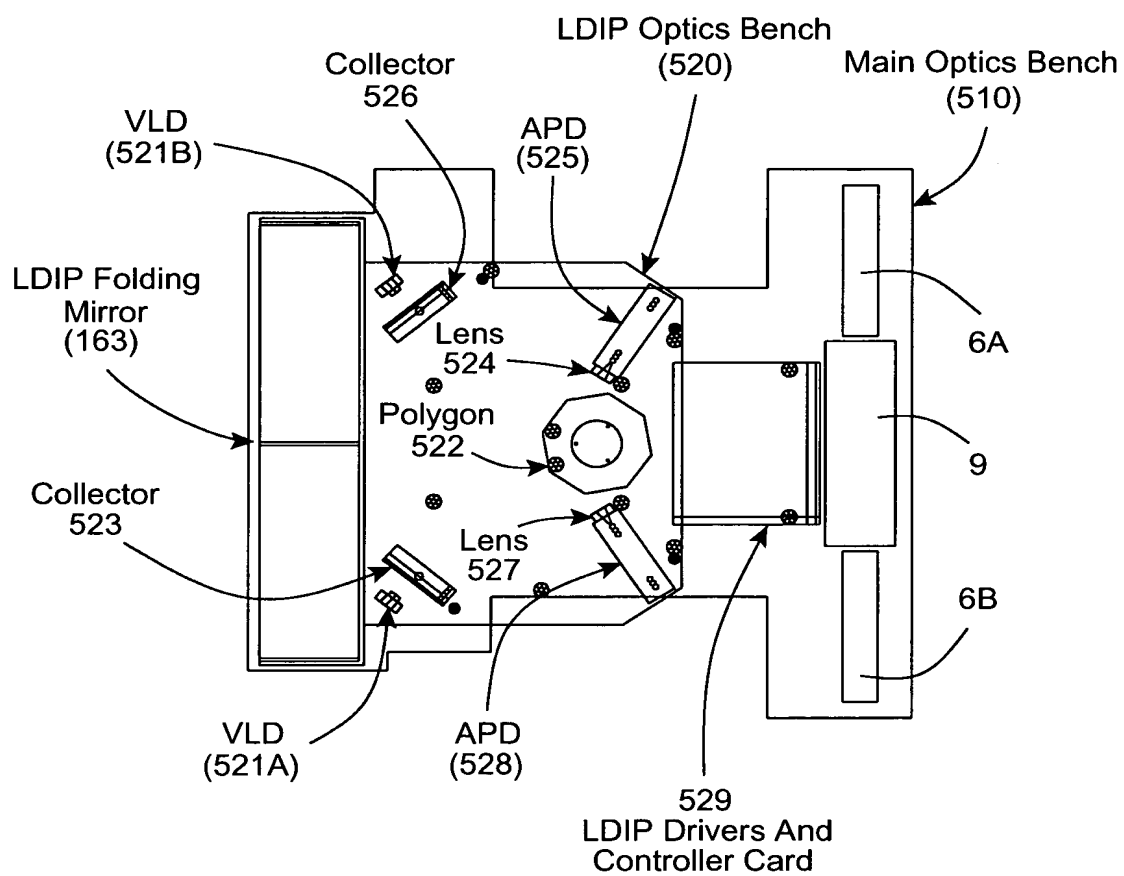
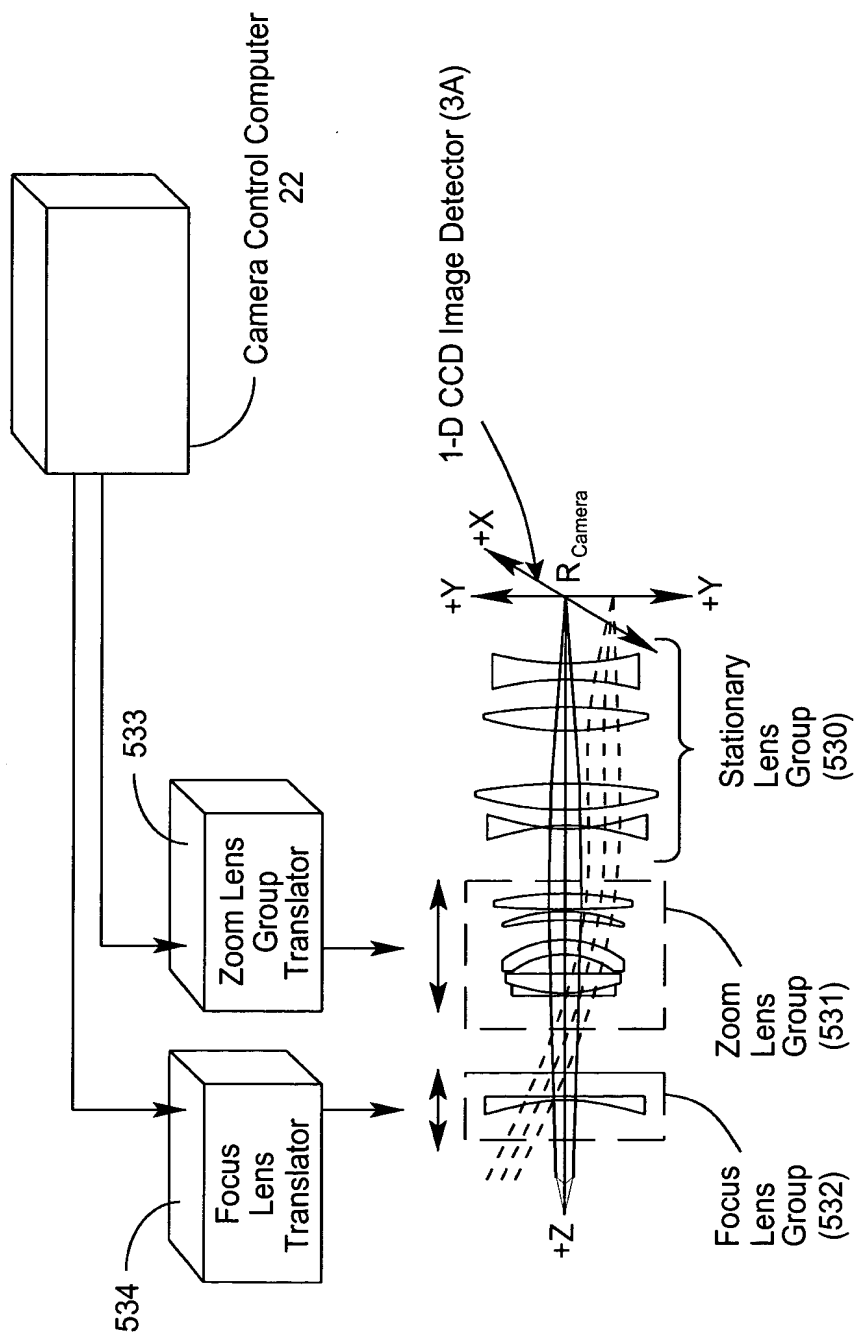


FIG. 12D



Main Optics Lens Groups

FIG. 12E

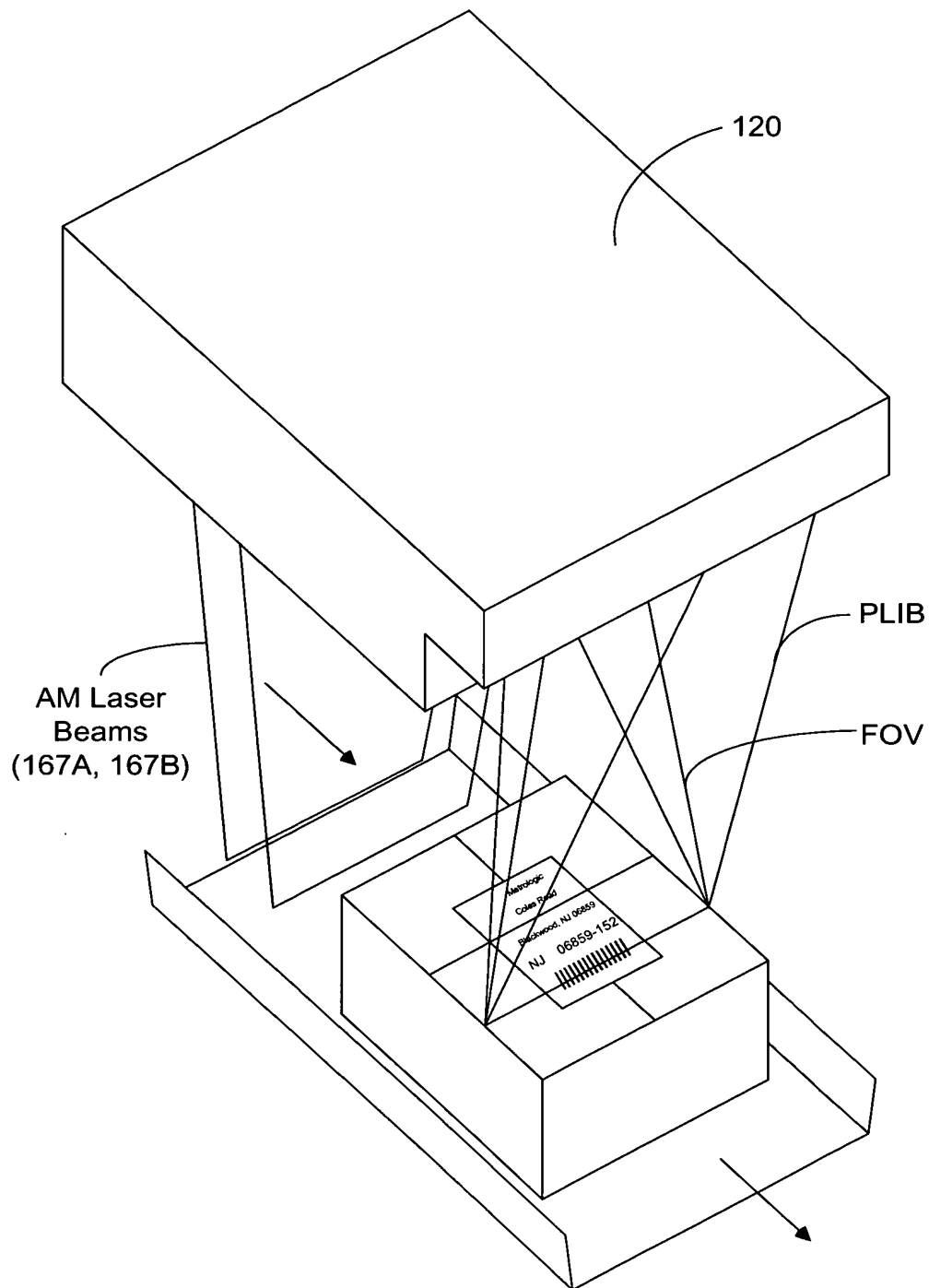
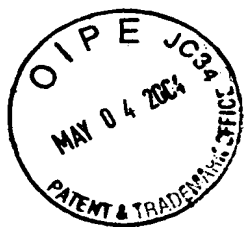


FIG. 13A

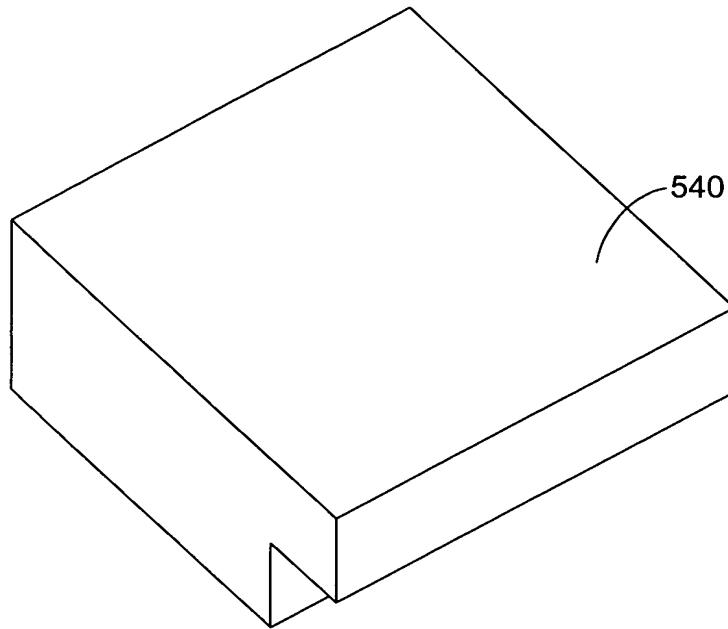


FIG. 13B

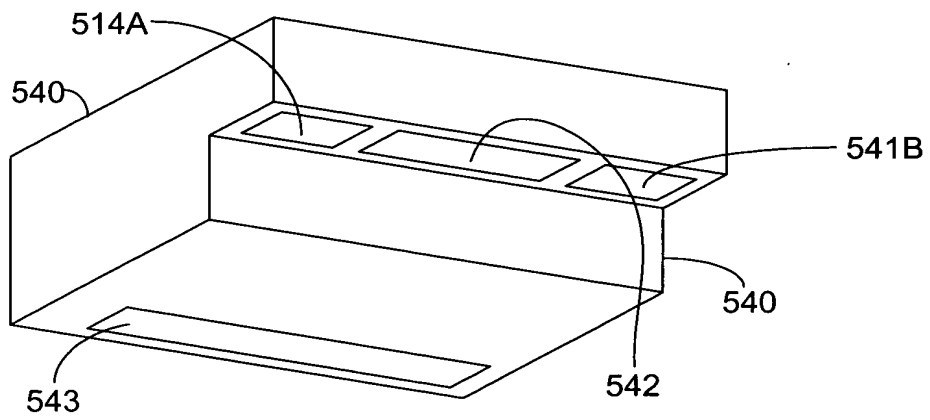


FIG. 13C



PLIIM-BASED PACKAGE IDENTIFICATION AND
DIMENSIONING (PID) SYSTEM

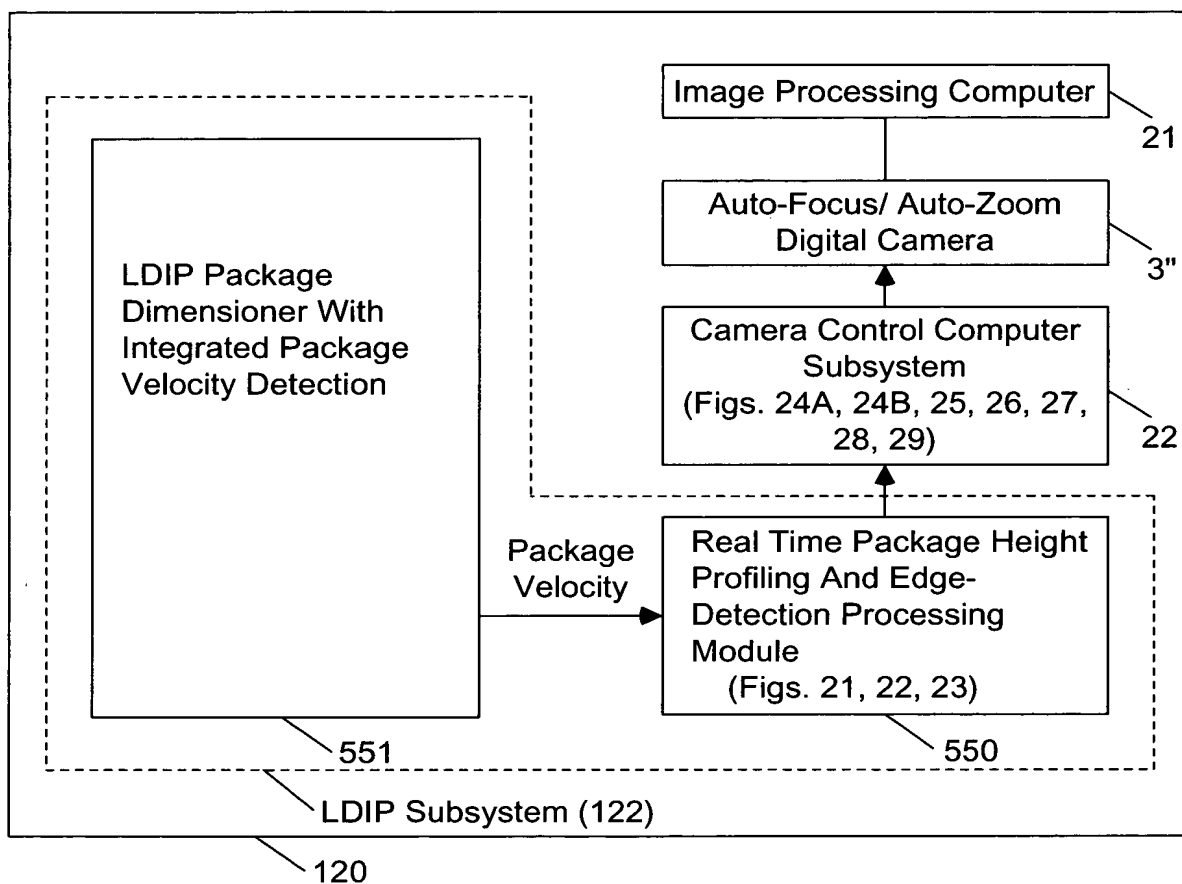


FIG. 14



LDIP REAL-TIME PACKAGE HEIGHT PROFILE AND EDGE DETECTION METHOD

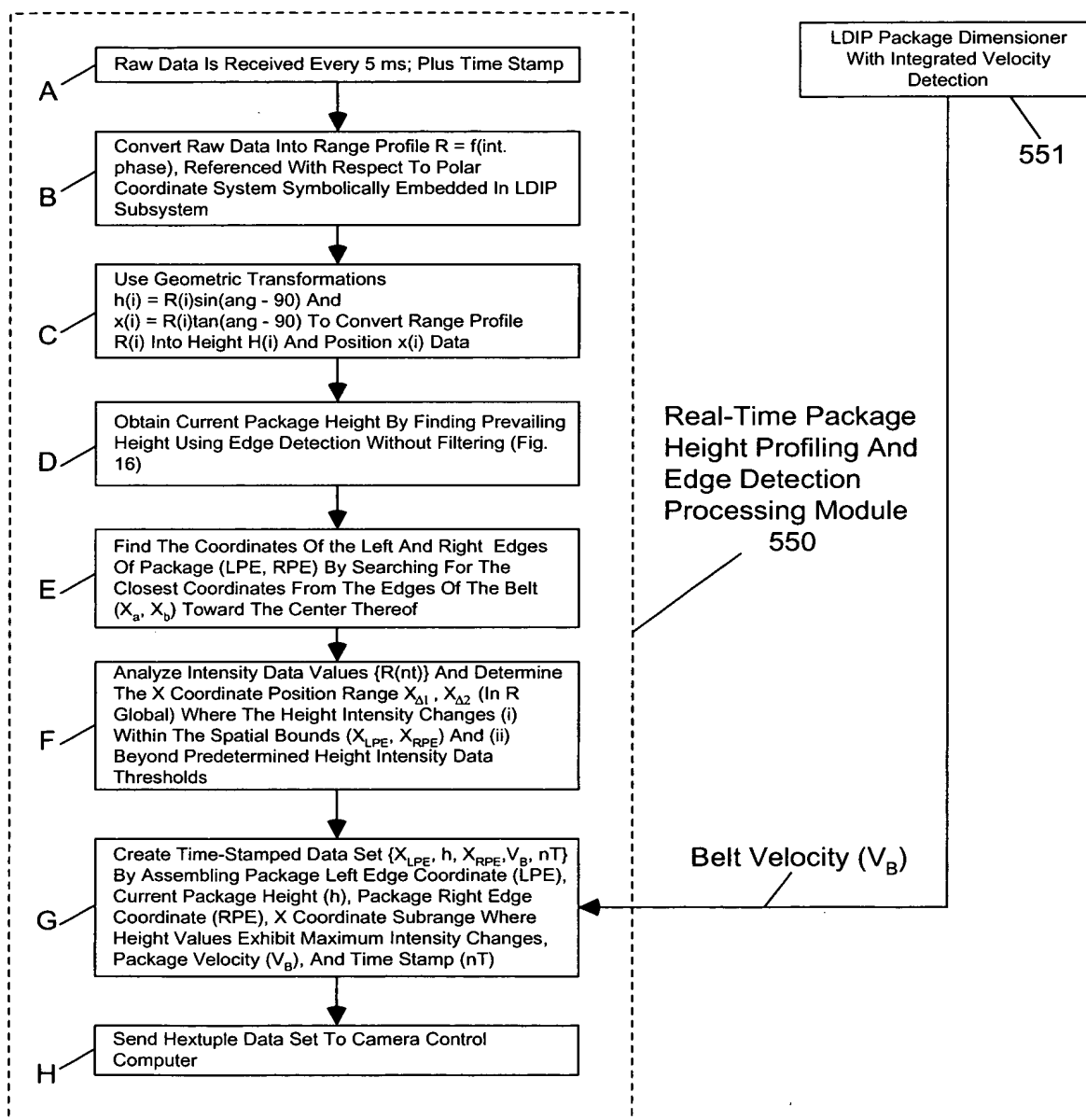
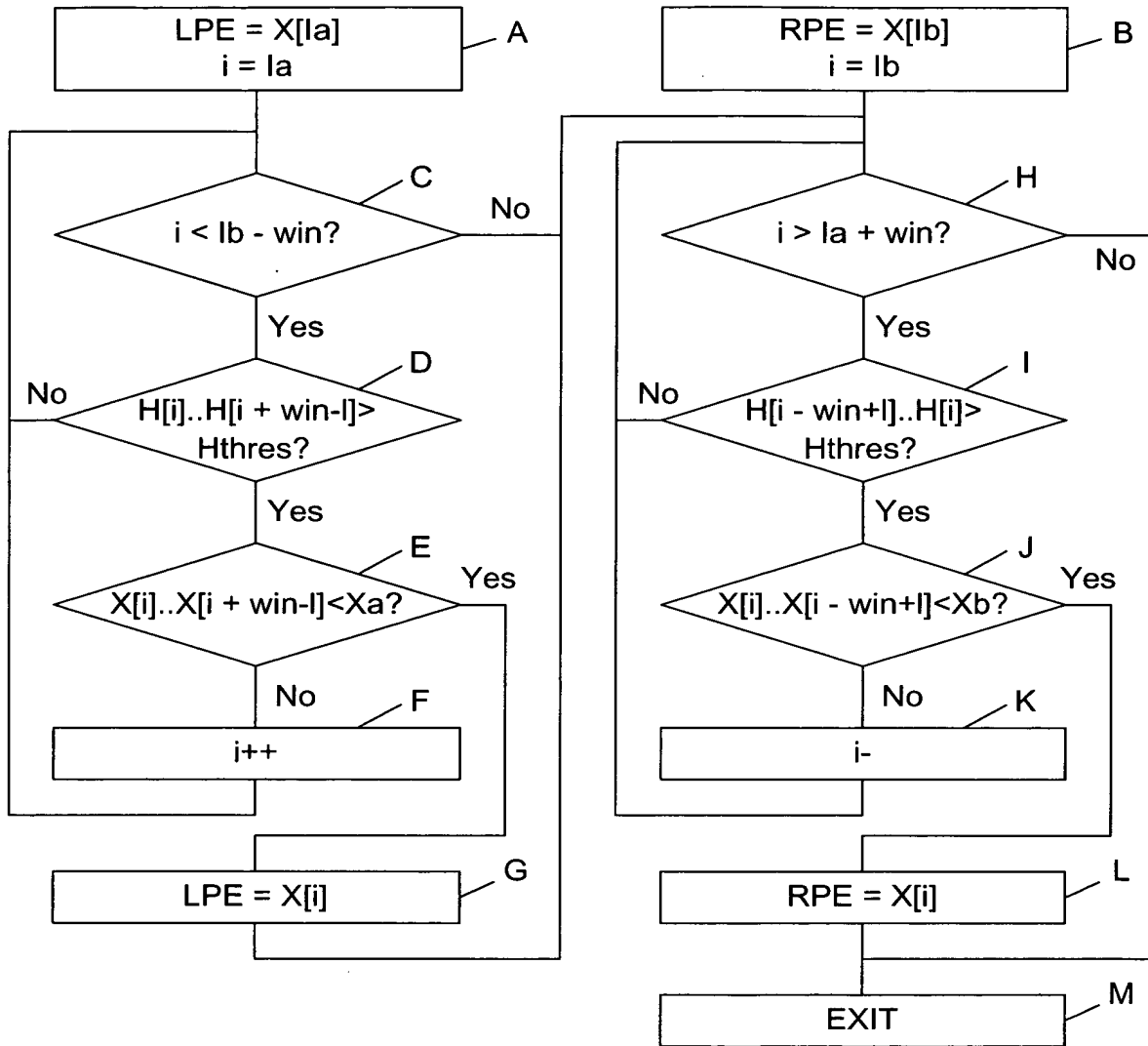


FIG. 15



LDIP REAL-TIME PACKAGE EDGE DETECTION



Xa = Location Of Belt Left Edge; Xb = Location Of Belt Right Edge
 la = Belt Left Edge Pixel; lb = Belt Right Edge Pixel
 LPE = Left package Edge; RPE = Right Package Edge
 H[] = Pixel Height Array; X[] = Pixel Location Array
 win = Package detection Window

FIG. 16

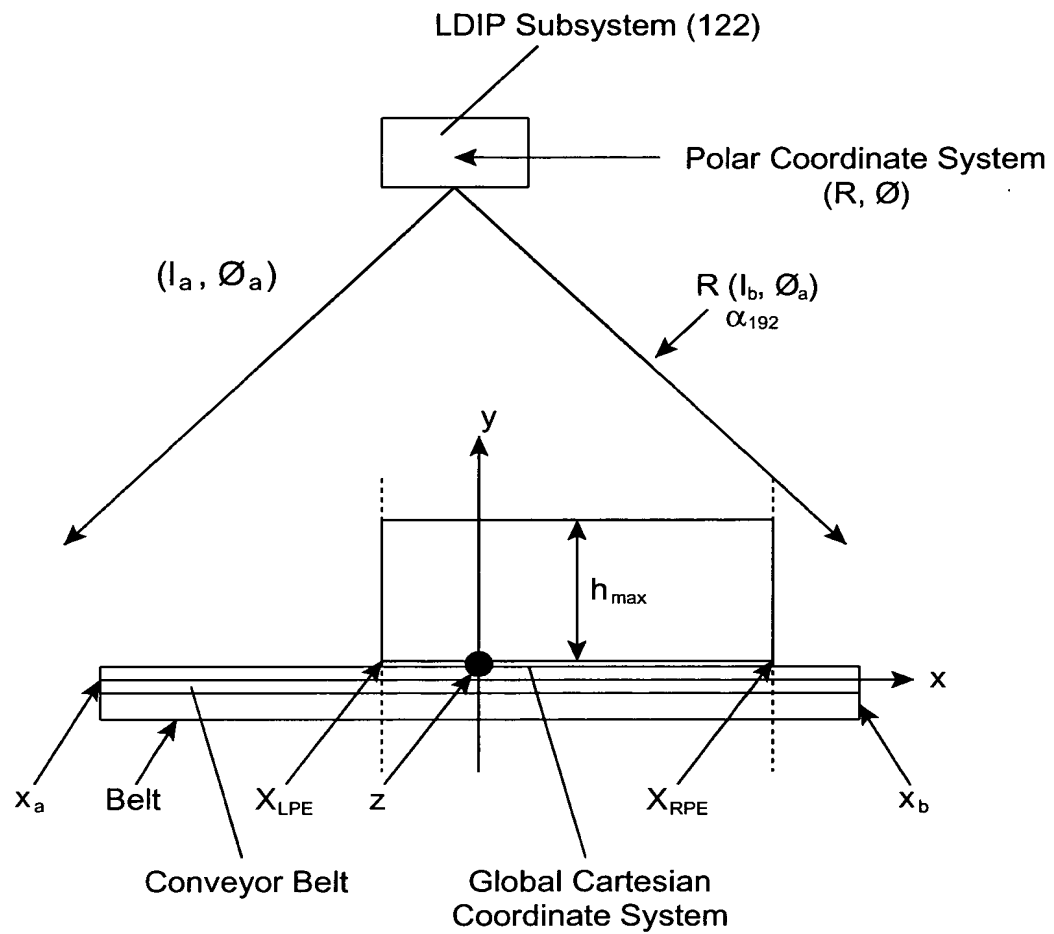


FIG. 17



Information Measured At Scan Angles Before Coordinate Transformations

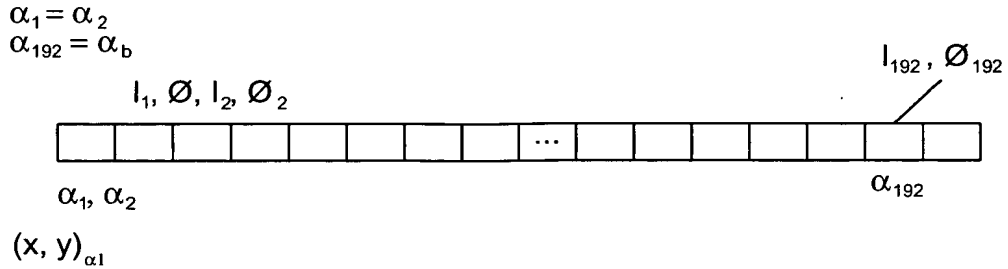


FIG. 17A

Range And Polar Angle Measures Taken At Scan Angle α Before Coordinate Transforms

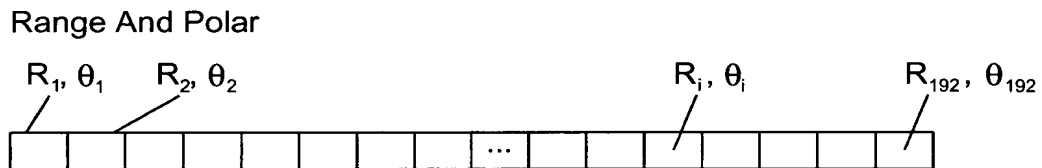


FIG. 17B

Measured Package Height And Position Values After Coordinate Transforms

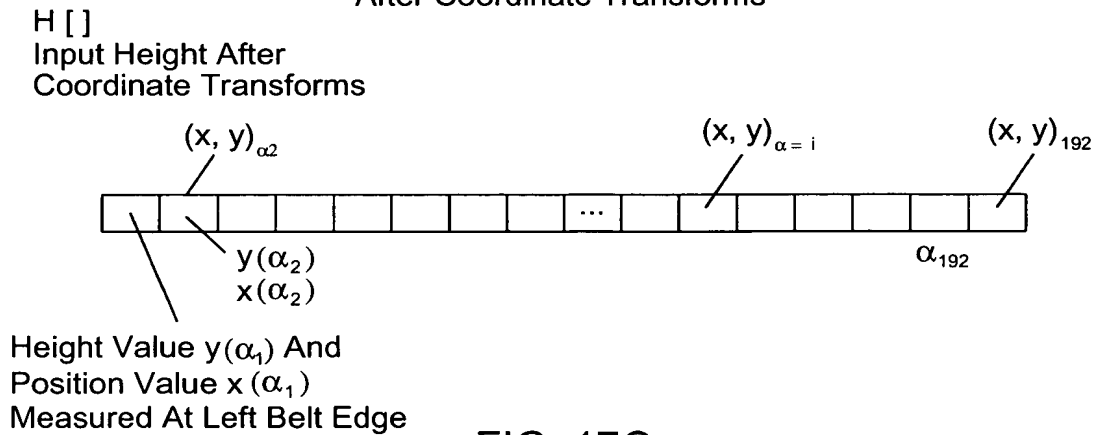


FIG. 17C



CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA
CONTROL SUBSYSTEM OF EACH OBJECT IDENTIFICATION AND
ATTRIBUTE ACQUISITION SYSTEM OF PRESENT INVENTION

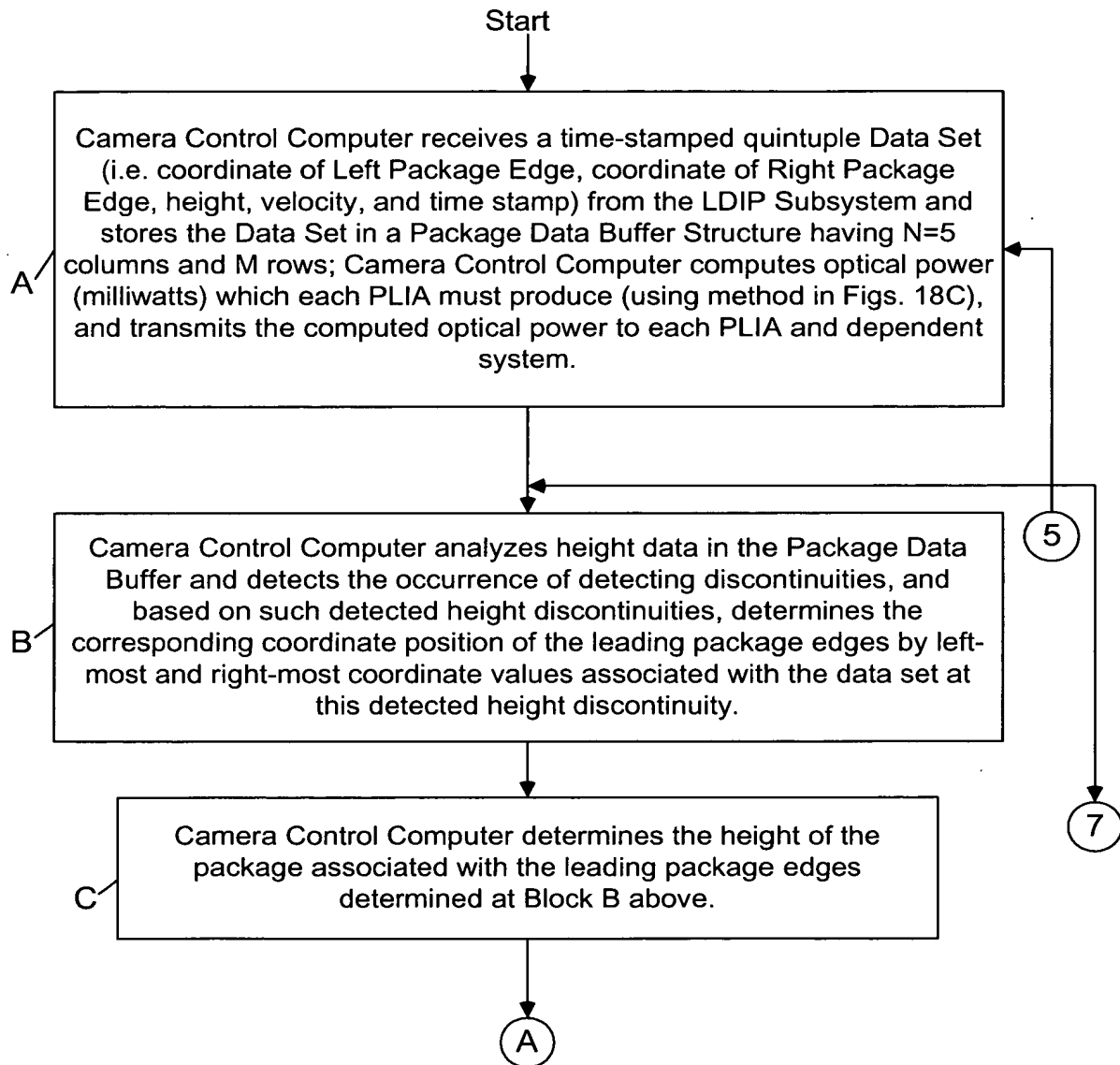


FIG. 18A-1

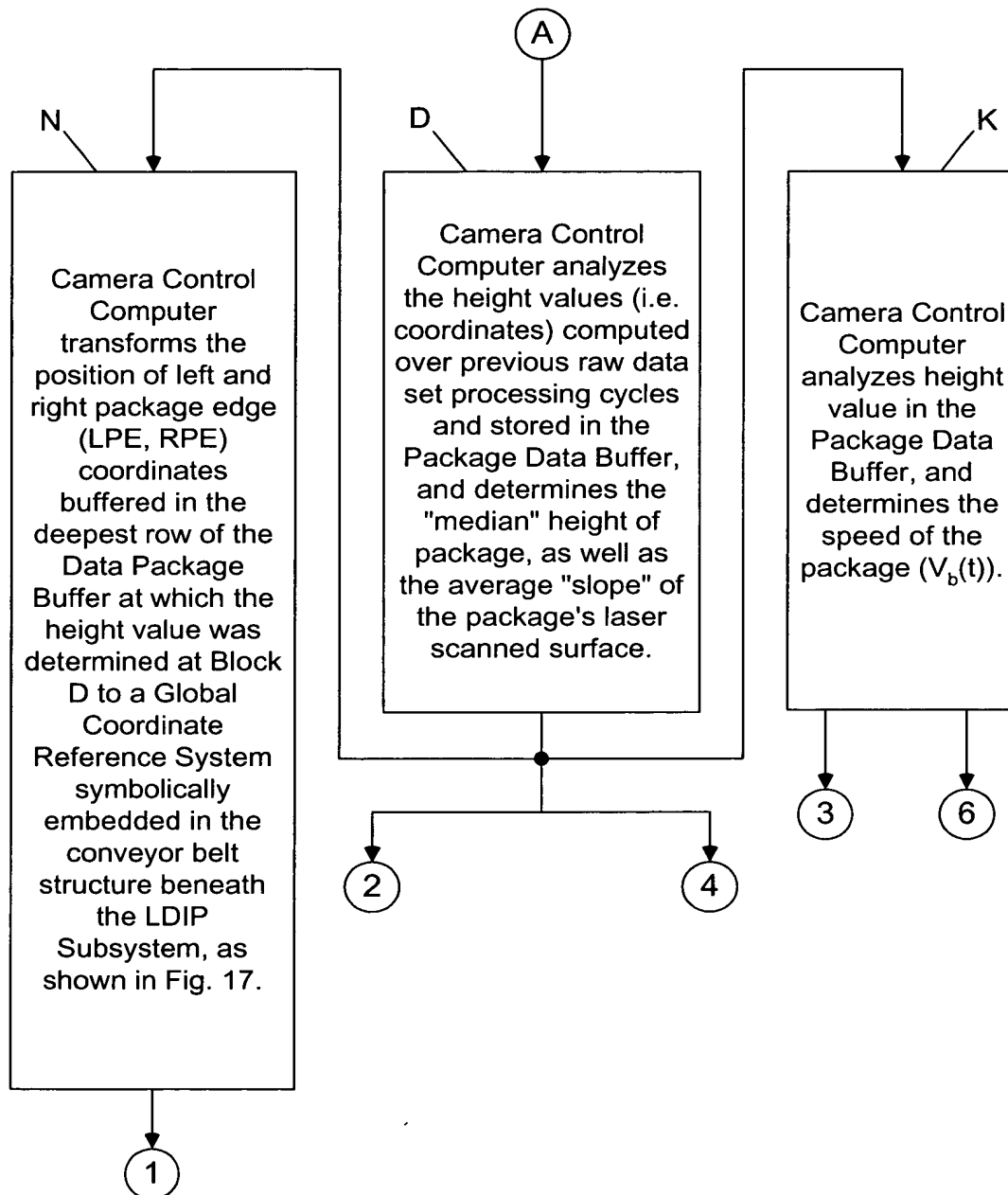
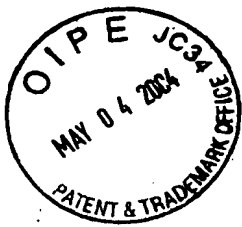


FIG. 18A-2

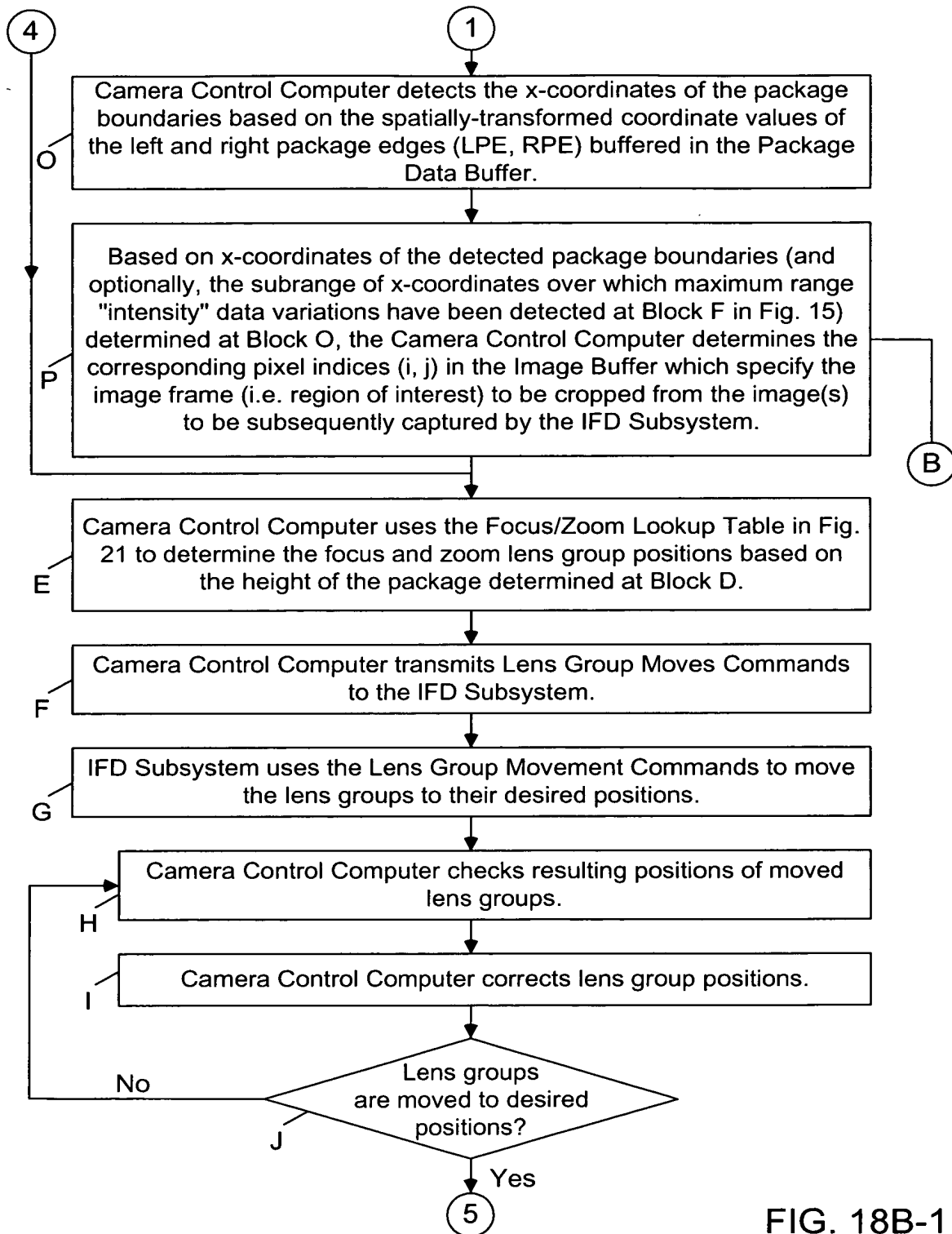


FIG. 18B-1

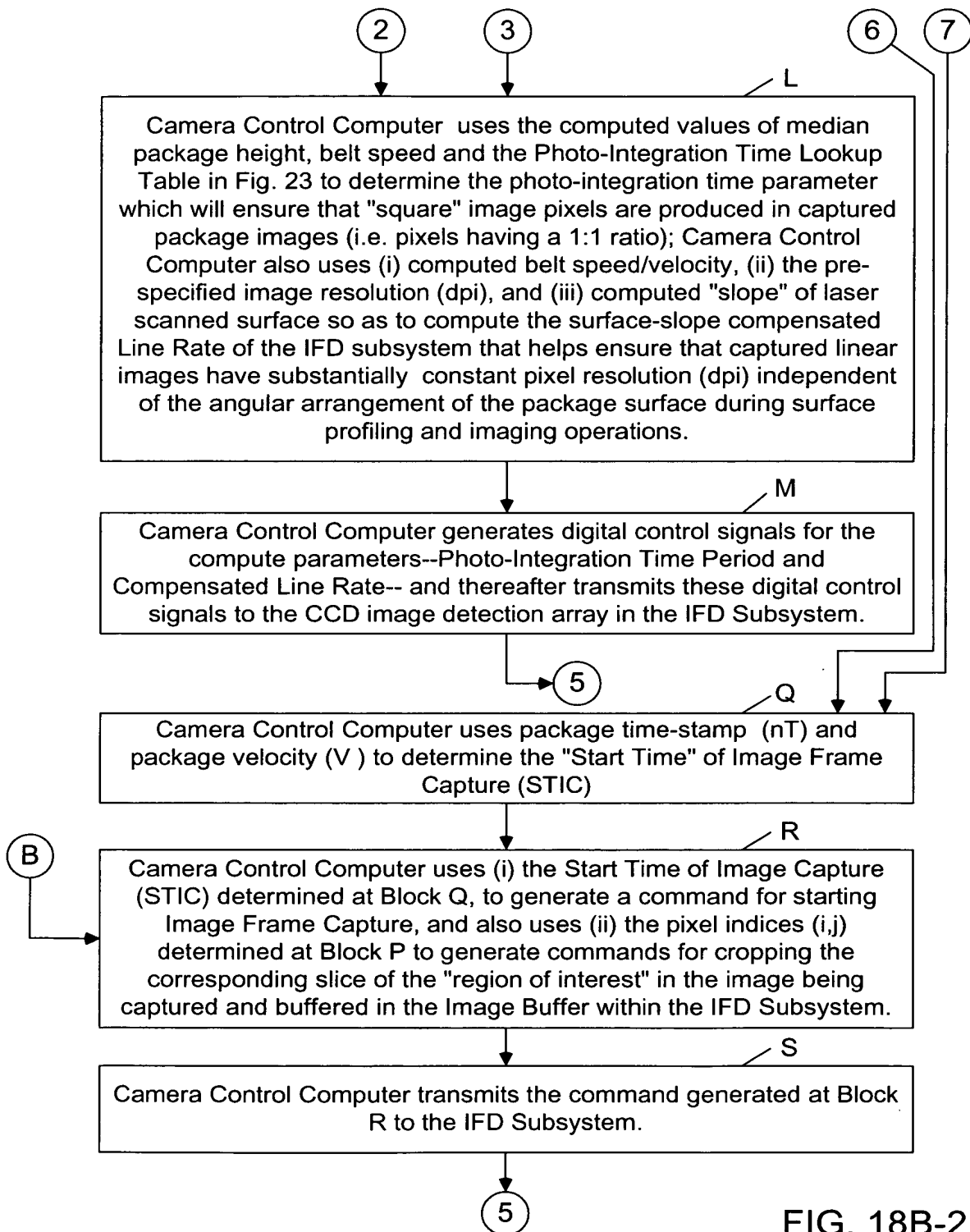


FIG. 18B-2



METHOD OF COMPUTING OPTICAL OUTPUT POWER FROM LASER
DIODES IN A PLANAR LASER ILLUMINATION ARRAY (PLIA) FOR
CONTROLLING THE CONSTANT WHITE-LEVEL IN IMAGE PIXELS
CAPTURED BY A PLIIM-BASED LINEAR IMAGER

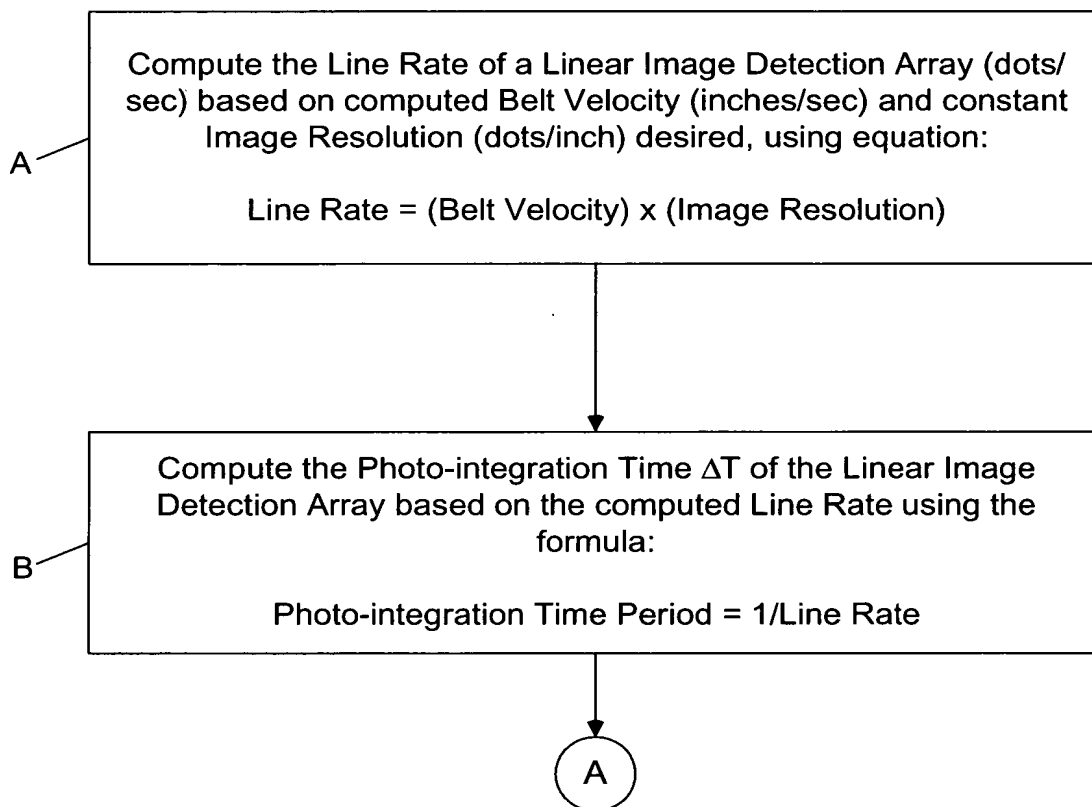
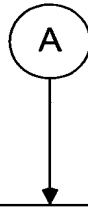


FIG. 18C1



Compute the Optical Power (milliwatts) of each PLIA based on the computed Photo-integration Time Period (ΔT) using the following formula:

$$\text{Optical Power of VLD (milliwatts)} = \frac{\text{constant}}{\text{Photo-integration Time Period } \Delta T}$$

FIG. 18C2



METHOD OF COMPUTING COMPENSATED LINE RATE FOR CORRECTING
VIEWING-ANGLE DISTORTION OCCURRING IN IMAGES OF OBJECT
SURFACES CAPTURED AS OBJECT SURFACES MOVE PAST A PLIIM-
BASED LINEAR IMAGER AT NON-ZERO SKEWED ANGLE

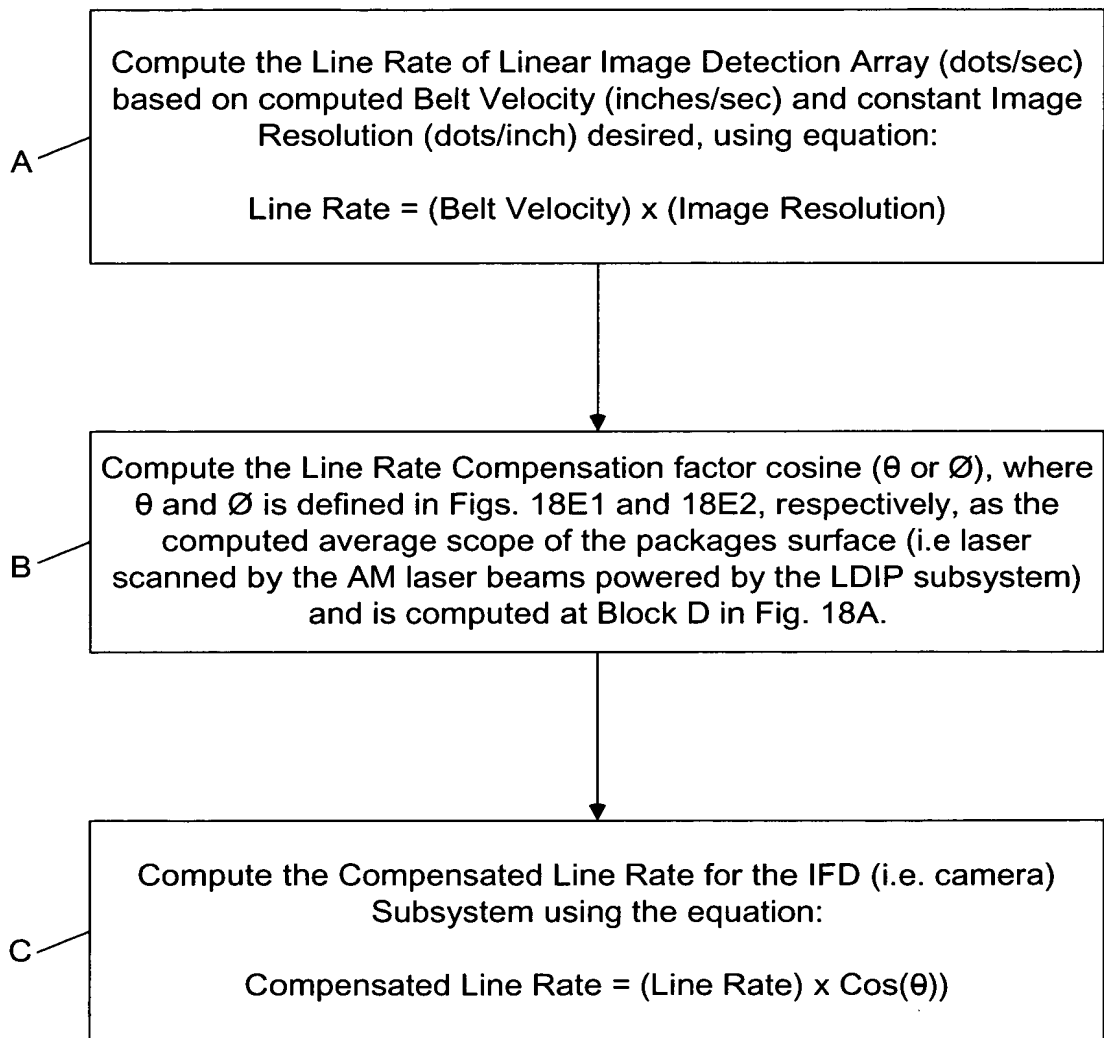


FIG. 18D

CASE 1:
Top Down Imaging

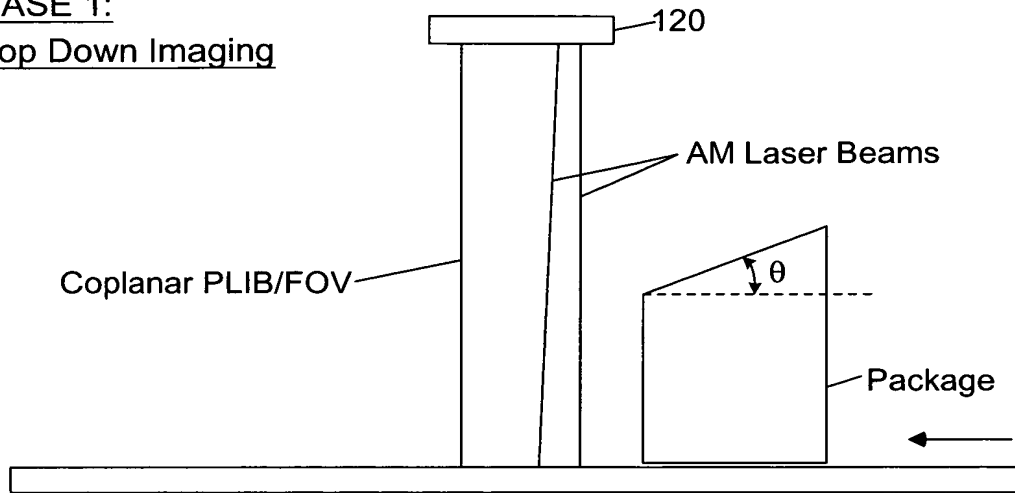


FIG. 18E1

CASE 2:
Side Imaging

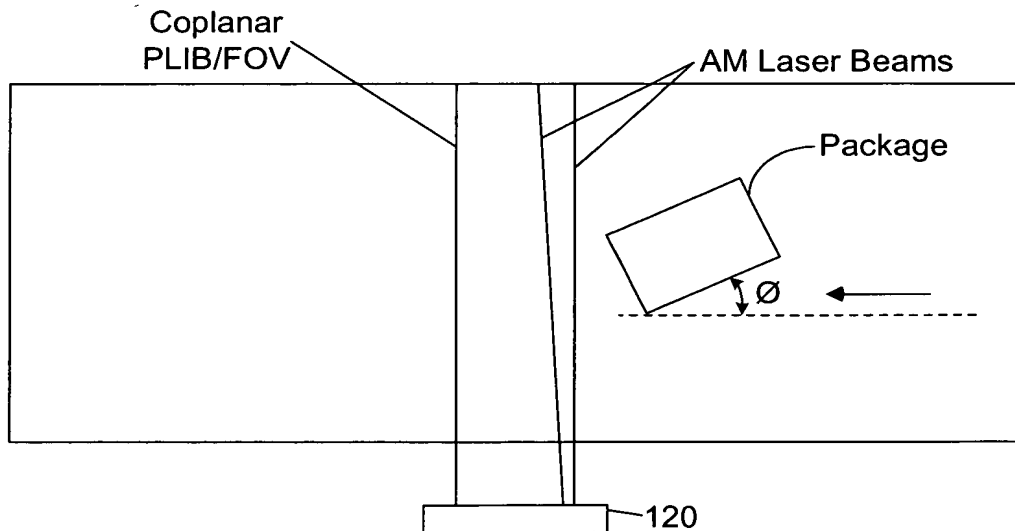
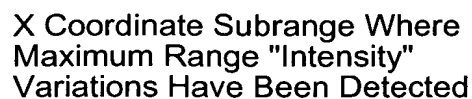


FIG. 18E2



Package Data Buffer (FIFO)

A 20x20 grid of squares. Above the grid, the word 'Columns' is written, followed by a horizontal arrow pointing to the right. To the left of the grid, the word 'Rows' is written, followed by a vertical arrow pointing downwards.

FIG. 20



Zoom And Focus Lens Group Position
Look-Up Table

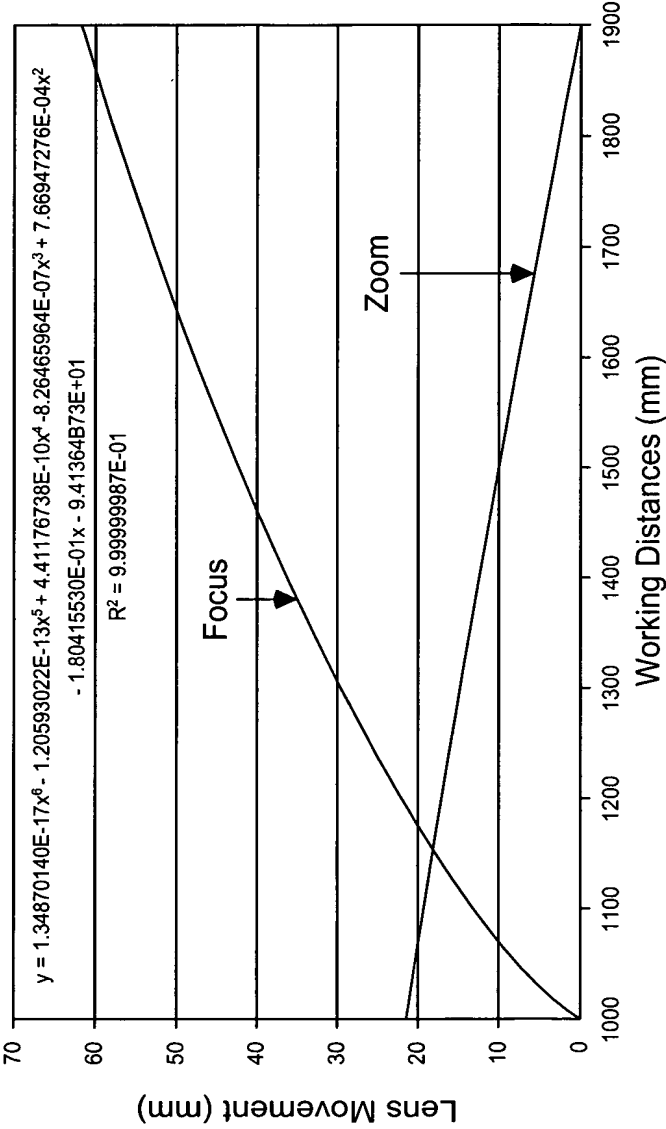
Distance From Camera H (mm)	Zoom Group Distance (mm) Y (Zoom)	Focus Group Distance (mm) Y (Focus)
1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 (Use Interpolation Techniques For Working Distances Between Listed Points In Table)	21.57489228 19.38089696 17.10673434 14.77137314 12.39153565 9.979114358 7.540639114 5.078794775 2.595989366 0.099972739	2.47E-05 10.99009783 20.65783177 29.10917002 36.47312595 42.87845436 48.44003358 53.25495831 57.40834303 60.98883615

FIG. 21



* Note: The focal distance and zoom (eff. focal length) of camera lens are coupled (inter-dependant) in this commercial embodiment.

Camera Has A Fixed Aperture F56
Focus And Zoom Lens Movement vs. Working Distances



$$y = 2.84791608E-18x^6 - 2.35121571E-14x^5 + 7.847795370E-11x^4 - 1.33426085E-07x^3 + 1.16929778E-04x^2 + 6.85049995E-02x + 4.87609108E+01$$
$$R^2 = 9.9999987E-01$$

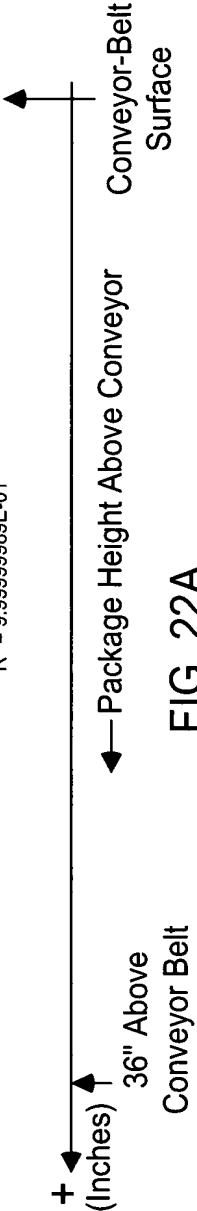


FIG. 22A



Photo-Integration Time Look-Up Table

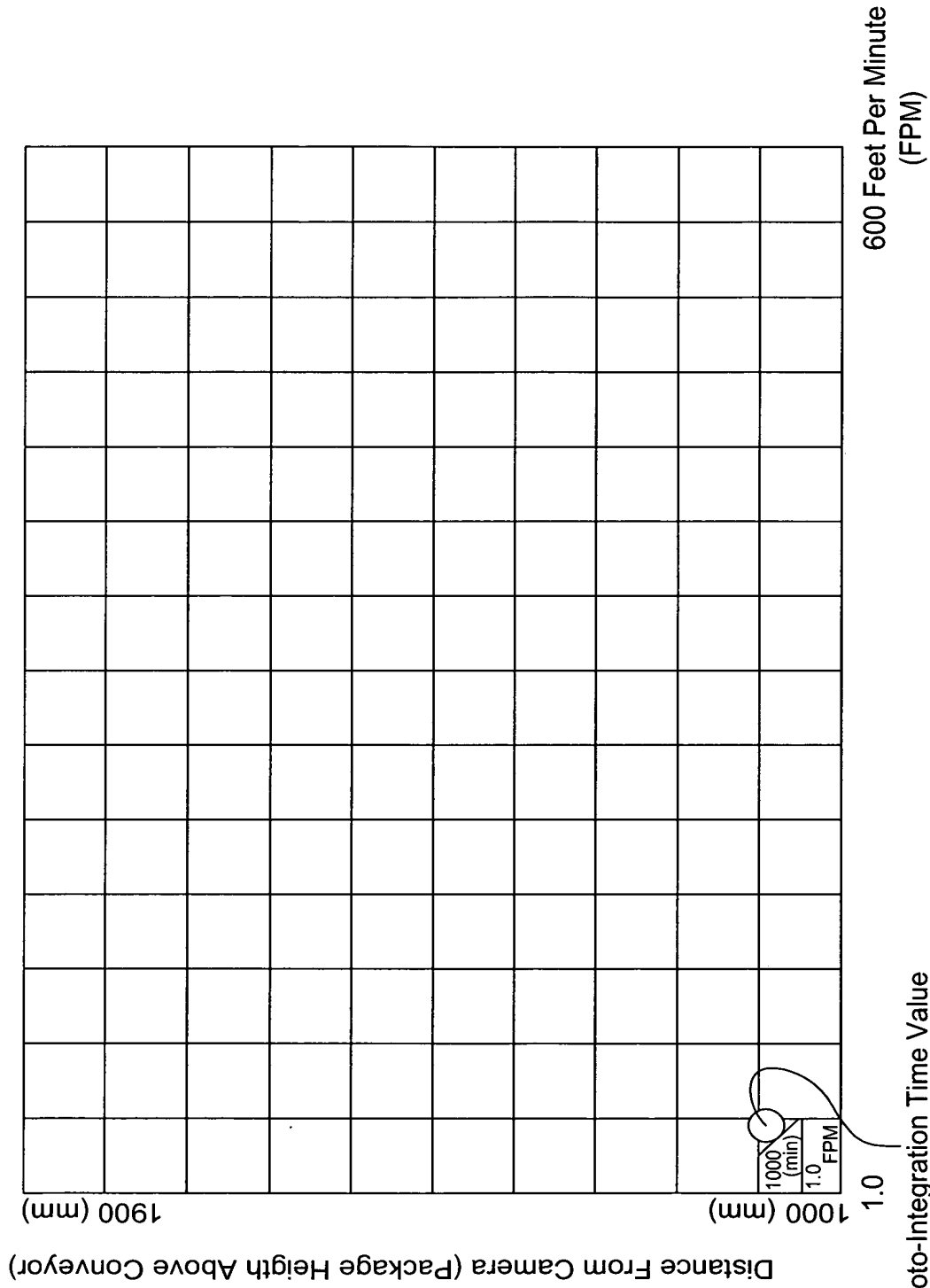


Photo-Integration Time Value
That Ensures Square Image
Pixels (1:1 aspect ratio)

FIG. 22B

3D Surface Profile And High Resolution Linear Image Data Capture At PLIM-Based Profiling And Imaging System

Geometrical Modelling Of Arbitrary 3-D Object Surface At Image Processing Computer

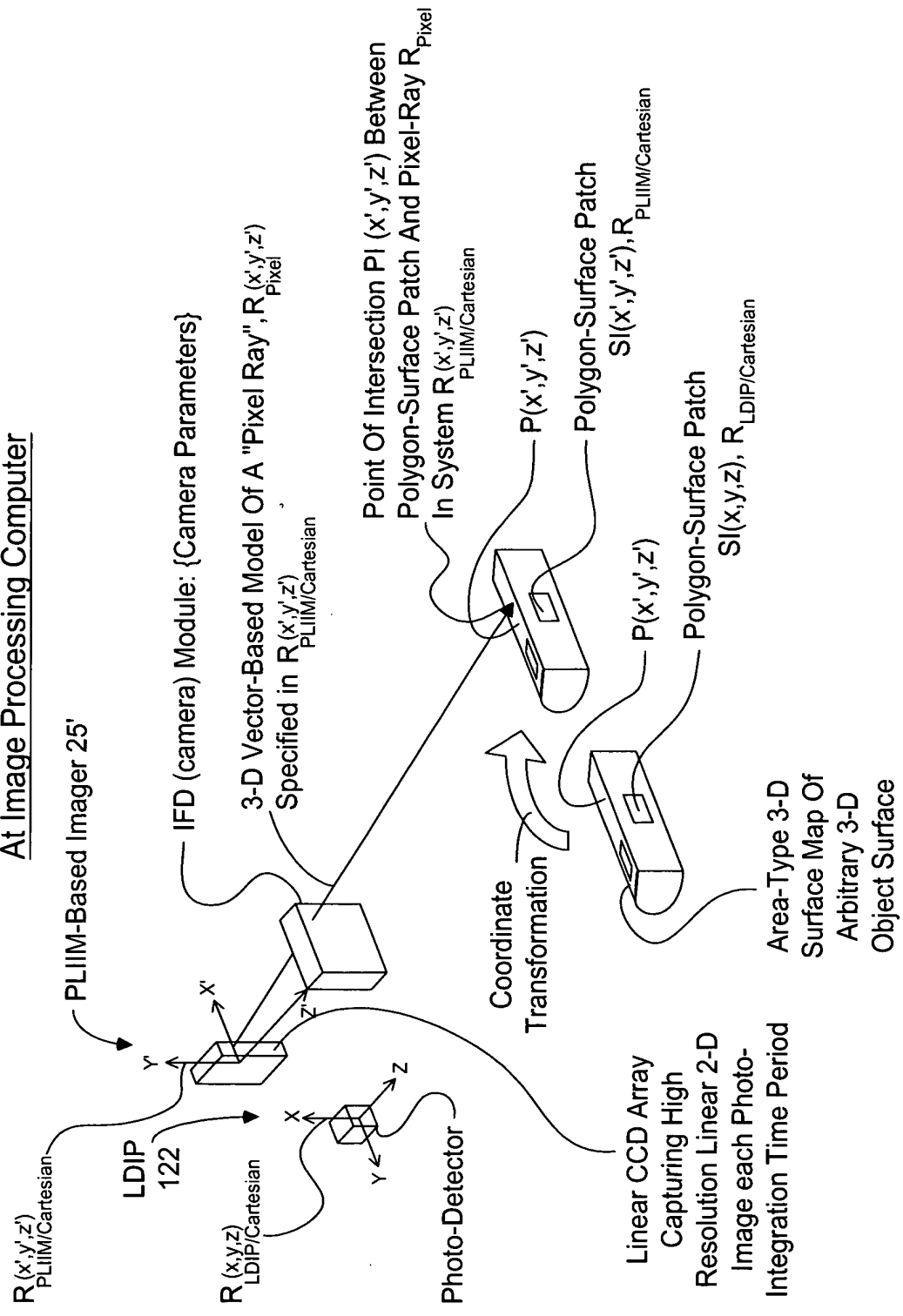


FIG. 23B



METHOD OF AND APPARATUS FOR PERFORMING AUTOMATIC
RECOGNITION OF GRAPHICAL INTELLIGENCE CONTAINED IN 2-D
IMAGES CAPTURED FROM ARBITRARY 3-D OBJECT SURFACES

STEP 1: At the unitary PLIIM-based object imaging and profiling system, use the laser doppler imaging and profiling (LDIP) subsystem employed therein to (i) consecutively capture a series of linear 3-D surface profile maps on a targeted arbitrary (e.g. non-planar or planar) 3-D object surface bearing forms of graphical intelligence and (ii) measure the velocity of the arbitrary 3-D object surface, wherein the polar coordinates of each point in the captured linear 3-D surface profile map are specified in a local polar coordinate system $R_{LDIP/polar}$, symbolically embedded within the LDIP subsystem.

A

STEP 2: At the unitary PLIIM-based object imaging and profiling system, use coordinate transforms to automatically convert the polar coordinates of each point $p(\alpha, R)$ in the captured linear 3-D surface profile map into x, y, z Cartesian coordinates specified as $p(x, y, z)$ in a local Cartesian coordinate system $R_{LDIP/Cartesian}$, symbolically embedded within the LDIP subsystem.

B

STEP 3: At the unitary PLIIM-based object imaging and profiling system, use the PLIIM-based imager employed therein to consecutively capture high-resolution linear 2-D images of the arbitrary 3-D object surface bearing forms of graphical intelligence (e.g. symbol character strings), wherein (i) the x', y' coordinates of each pixel in each said captured high-resolution linear 2-D image is specified in local Cartesian coordinate system $R_{PLIIM/Cartesian}$ symbolically embedded within the PLIIM-based imager, and (ii) the intensity value of the pixel $I(x', y')$ is associated with the x', y' Cartesian coordinates of the image detection element in the linear image detection array at which the pixel is detected, and (iii) wherein also the planar laser illumination beam (PLIB) of the PLIIM-based imager is spaced from the amplitude modulated (AM) laser scanning beam of the LDIP subsystem is about D centimeters.

C

A

FIG. 23C1

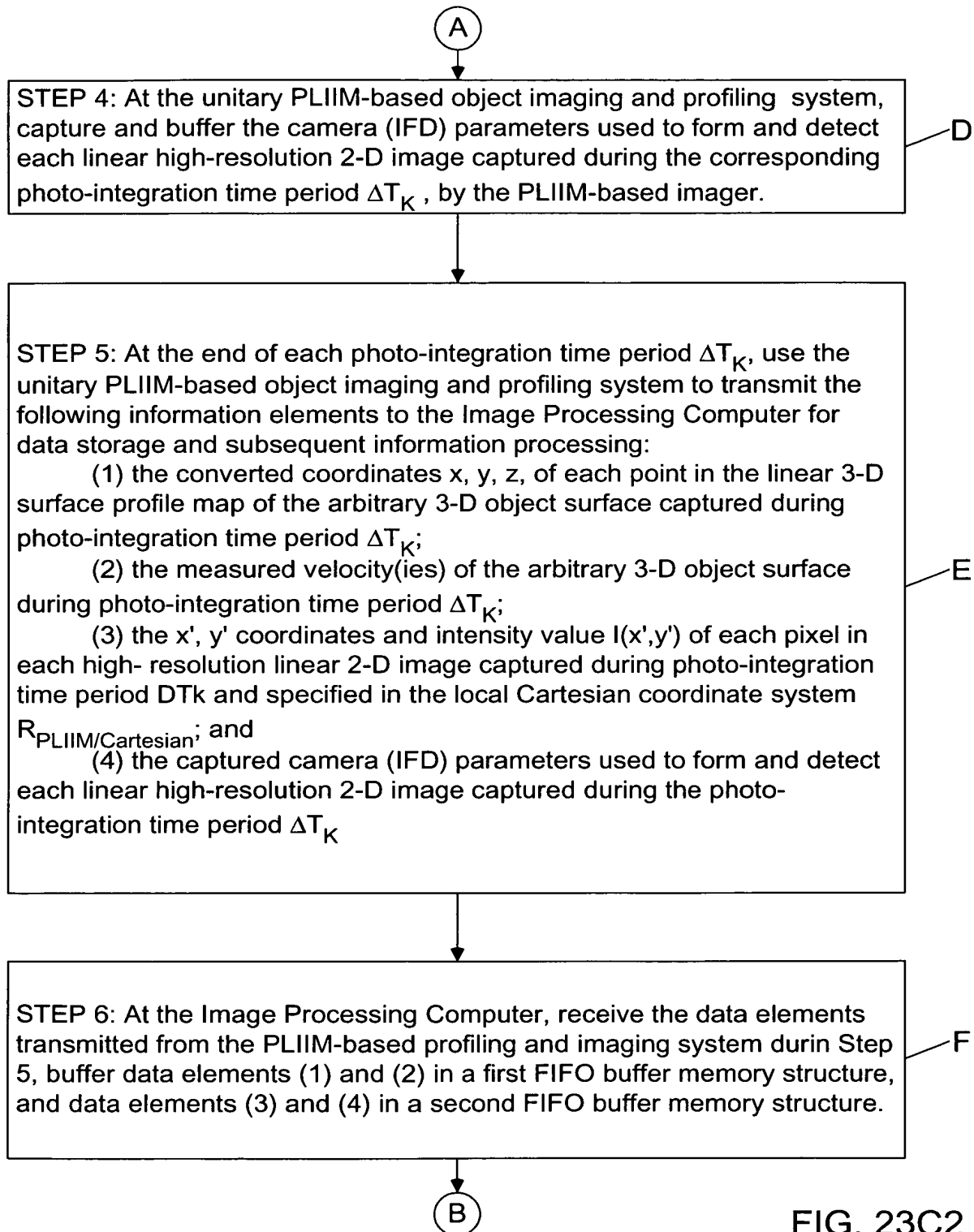


FIG. 23C2

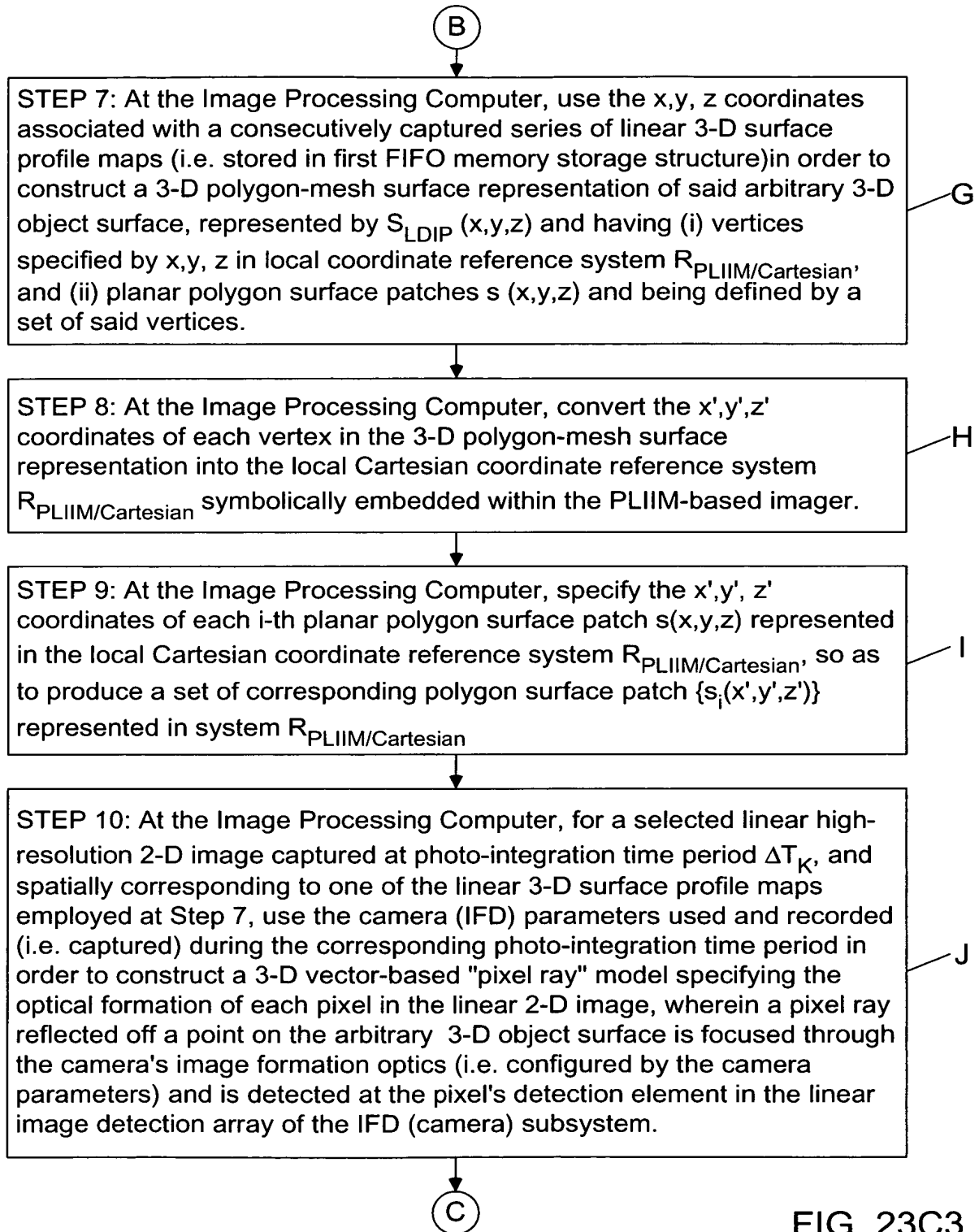


FIG. 23C3

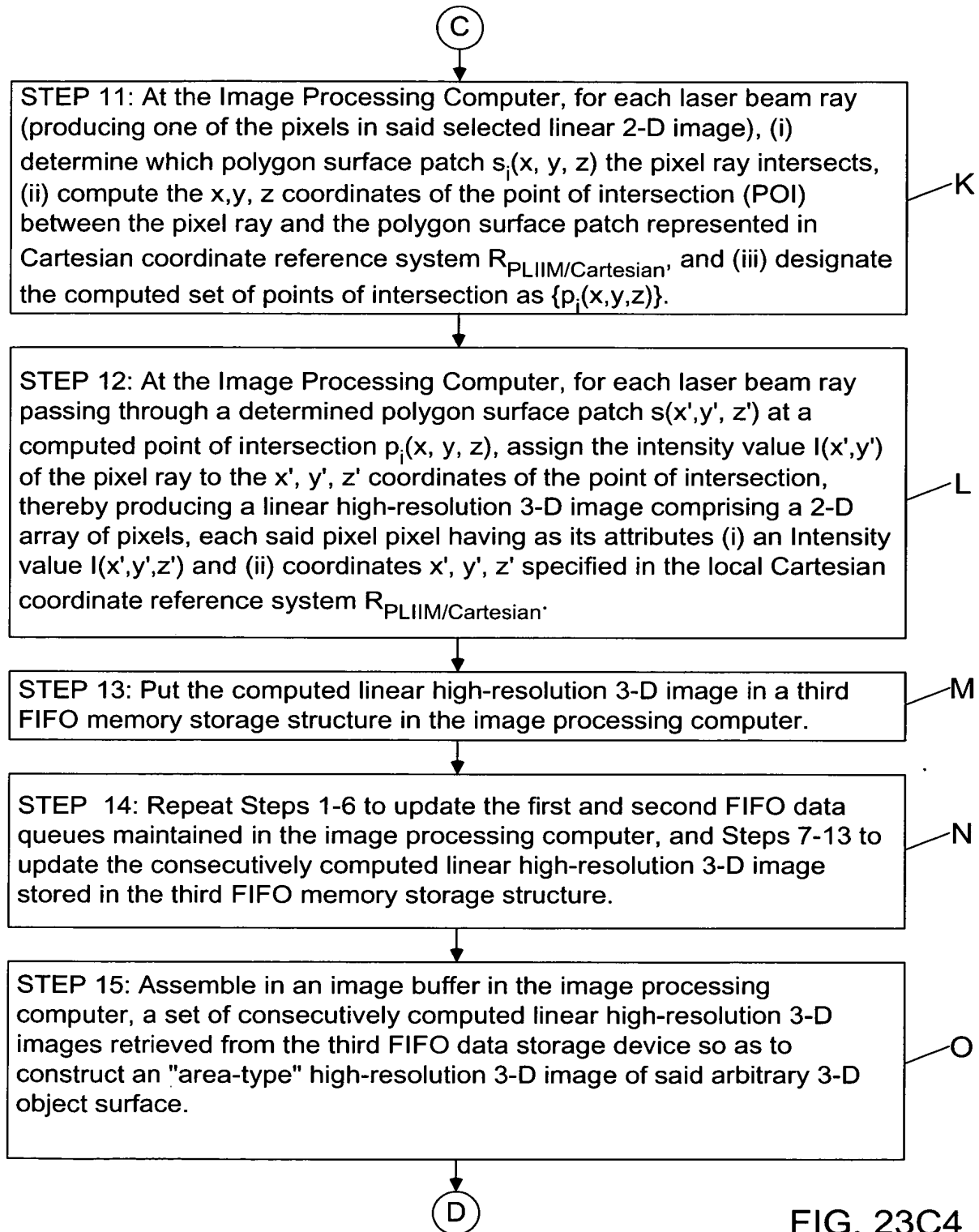


FIG. 23C4

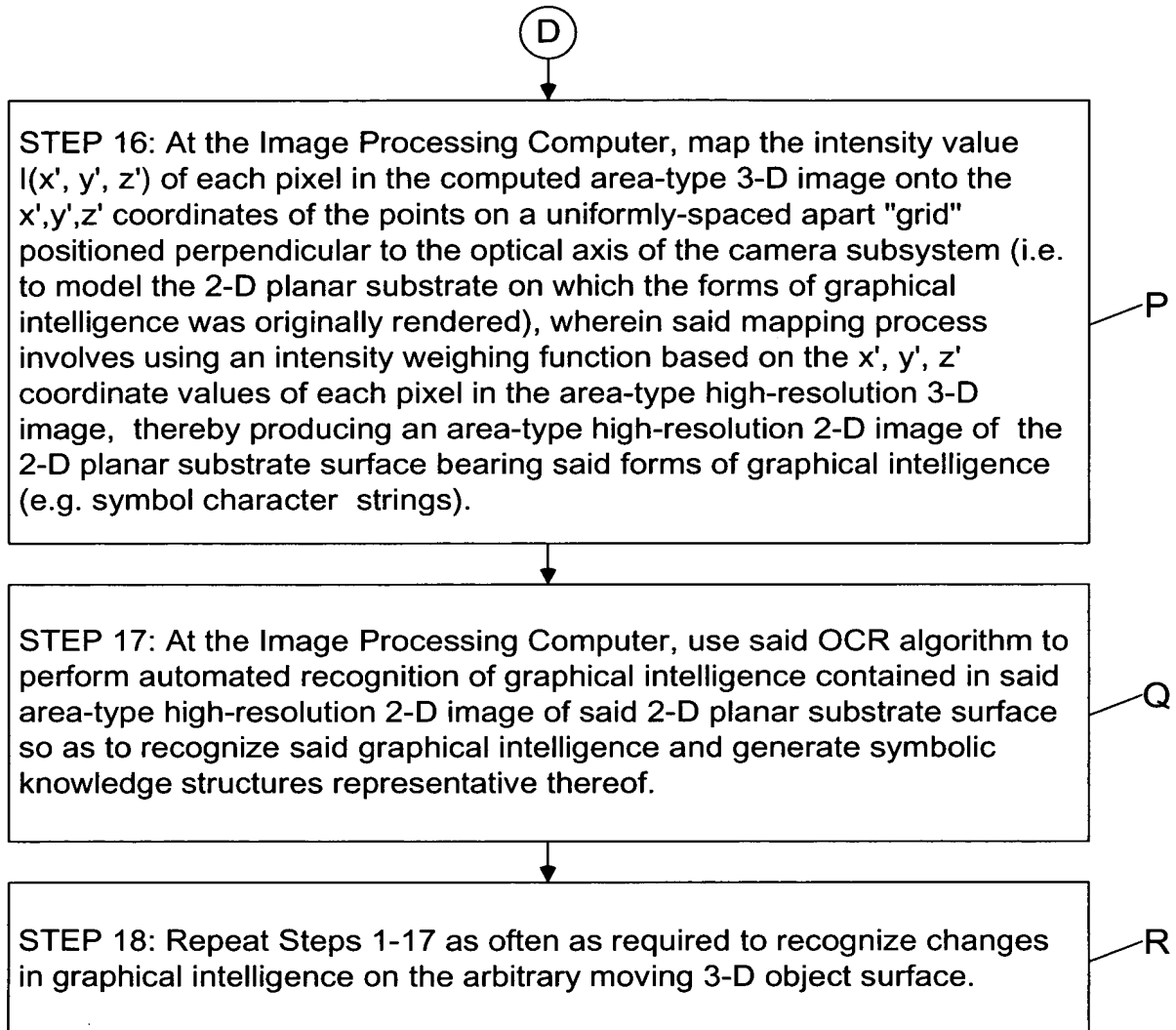


FIG. 23C5

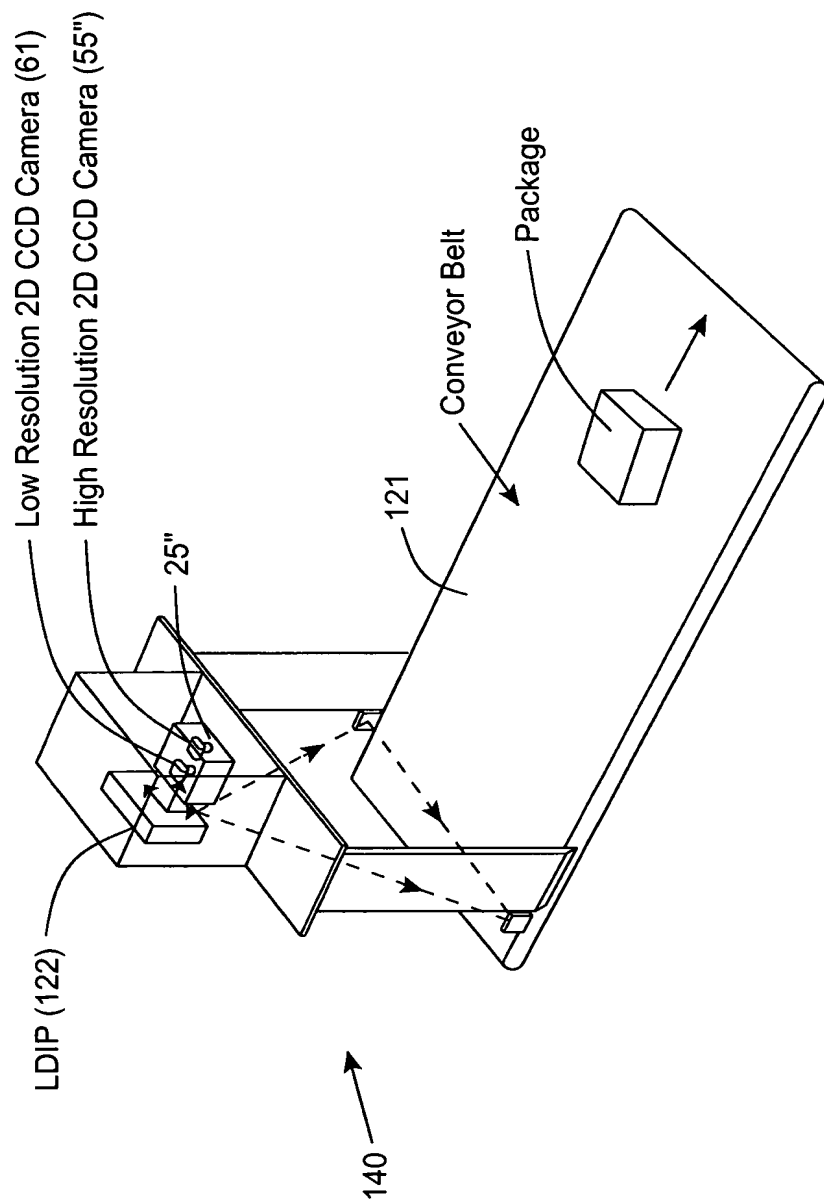


FIG. 24

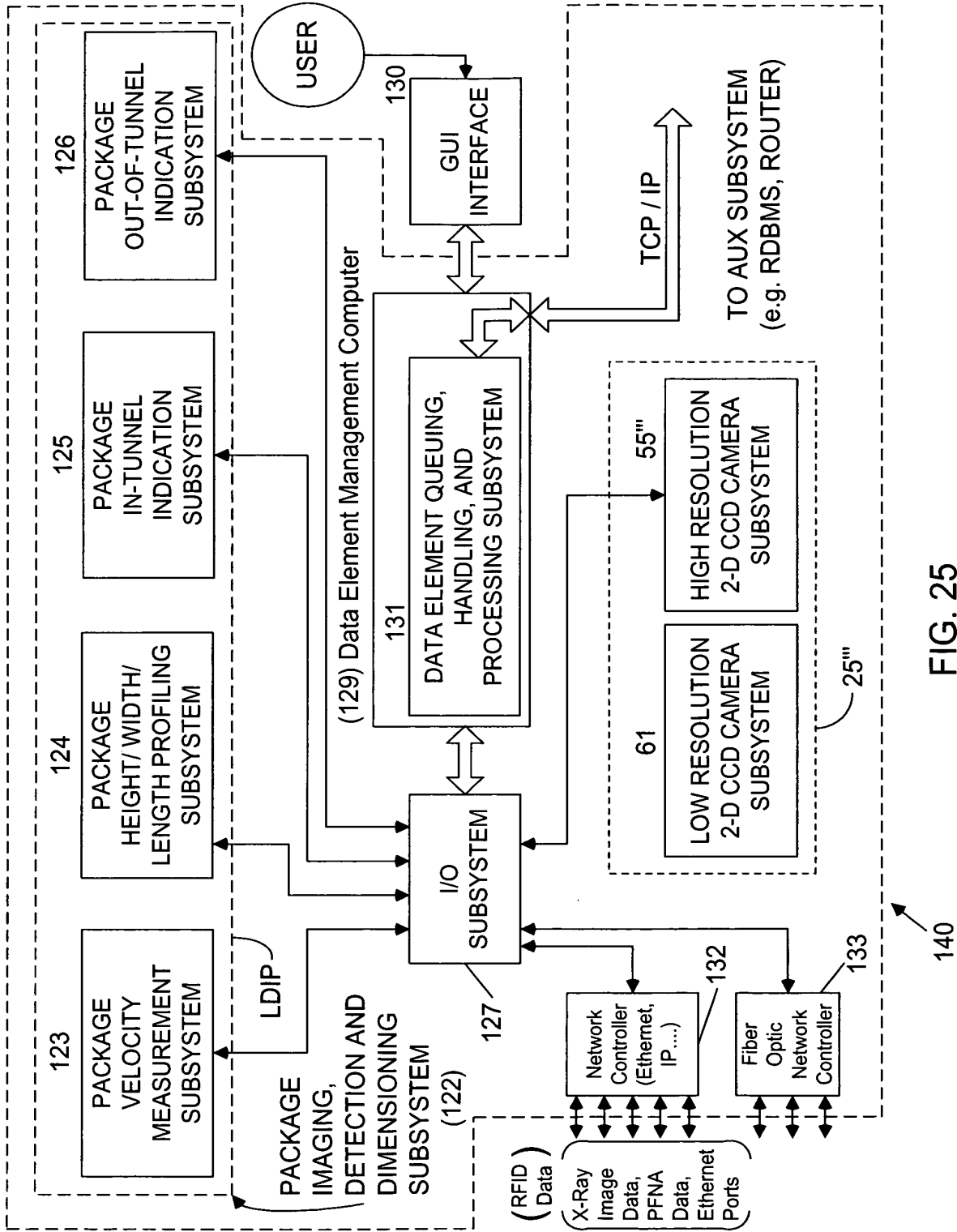


FIG. 25

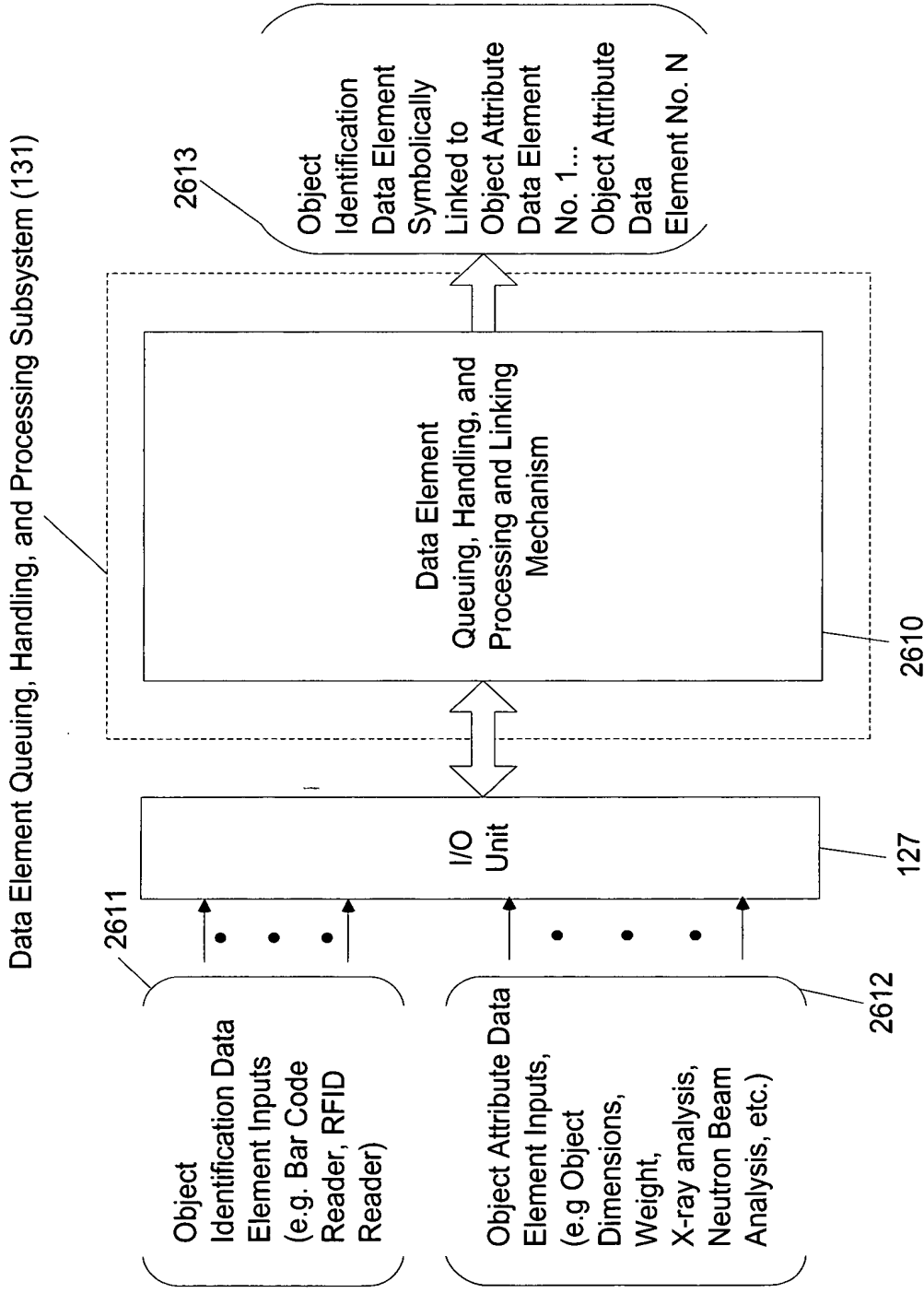


FIG. 25A



Specification of Object Detection, Tracking, and Identification and Attribute-Acquisition Capabilities of a Configured System or Network.

- Primary Network and/ or System Functions:
- A. Specification of Object Detection and Tracking Capability of System
- B. Specification of Object Identification Capability of System
- C. Specification of Object Attribute Acquisition Capability of System

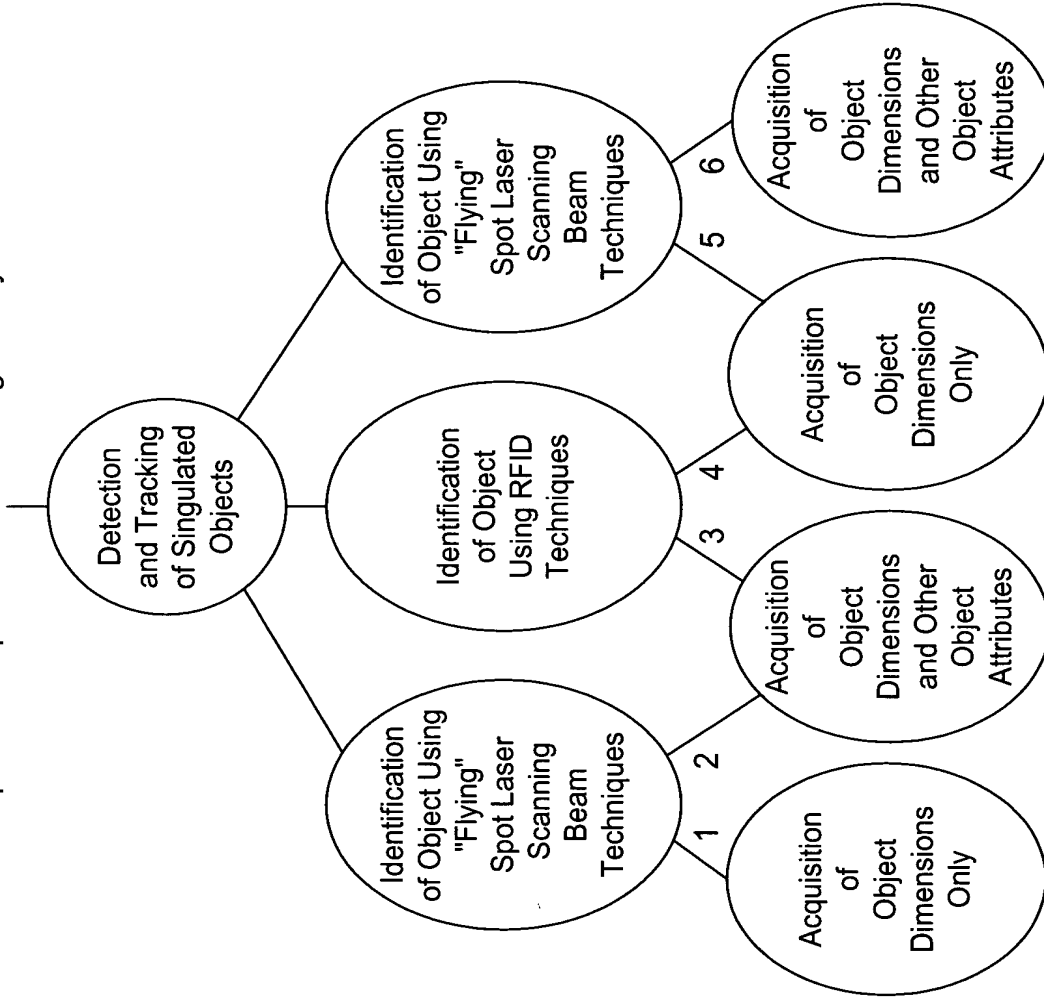


FIG. 25B-1

Specification of Object Detection, Tracking, and Identification and
 Attribute-Acquisition Capabilities of a Configured System or Network.

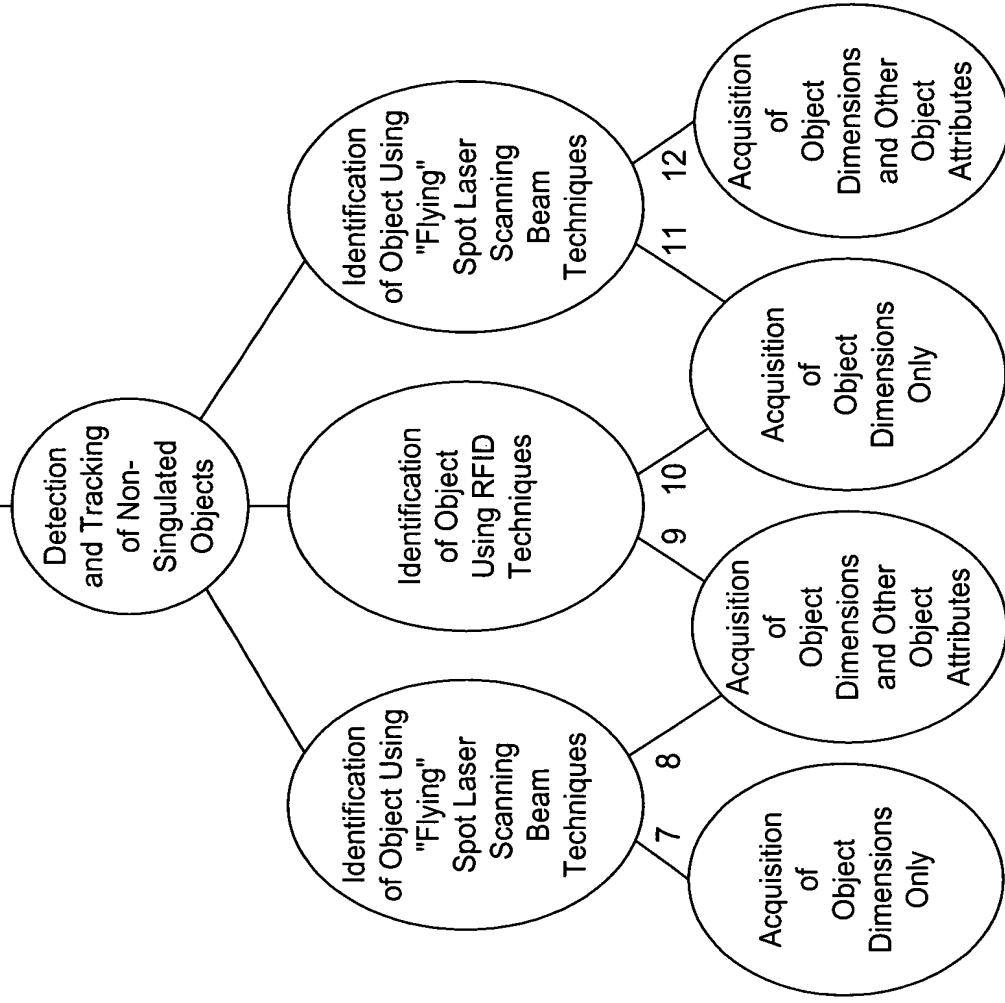


FIG. 25B-2

Primary Network and/ or System Functions:	
A. Specification of Object Detection and Tracking Capability of System	
B. Specification of Object Identification Capability of System	
C. Specification of Object Attribute Acquisition Capability of System	

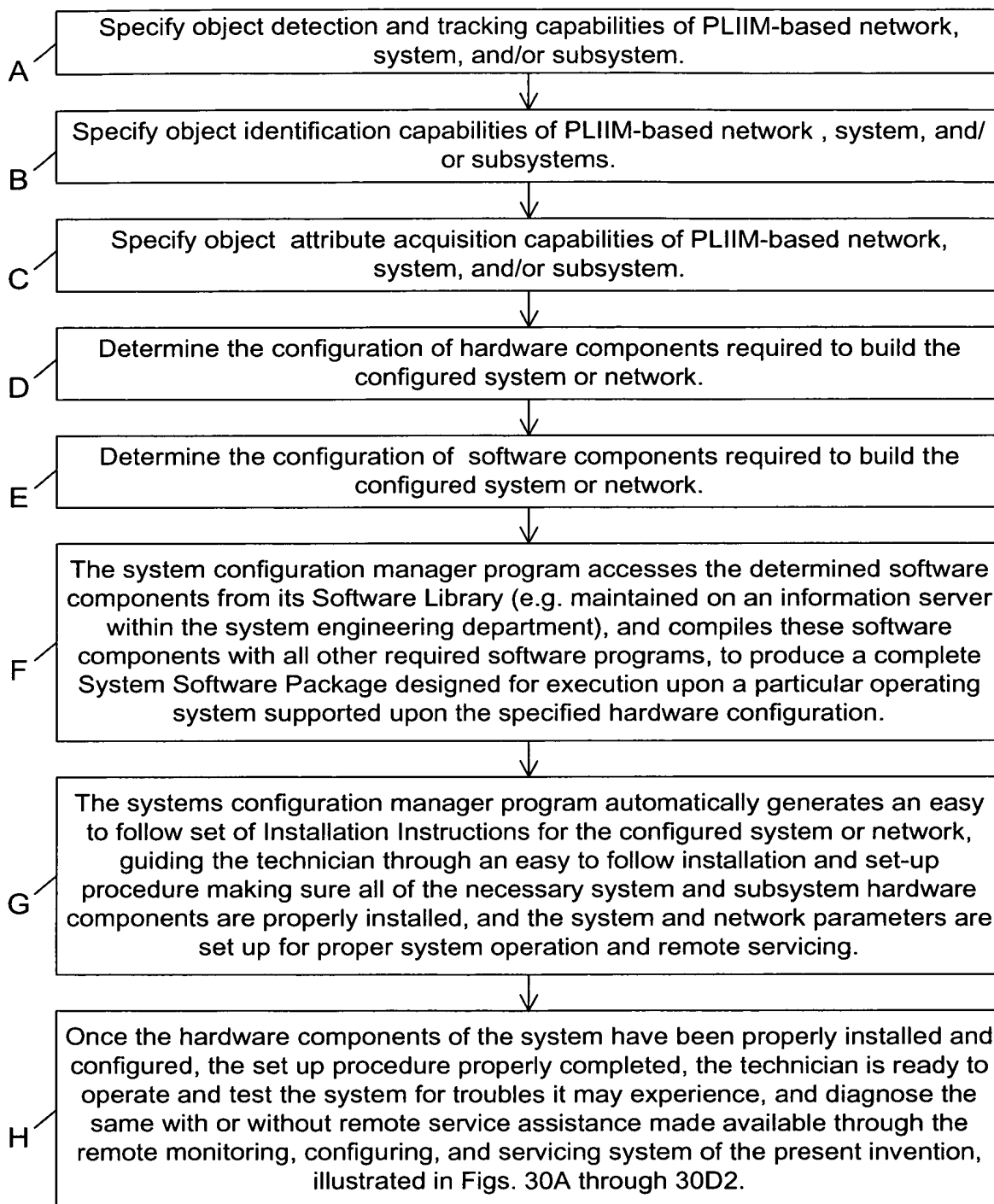


FIG. 25C

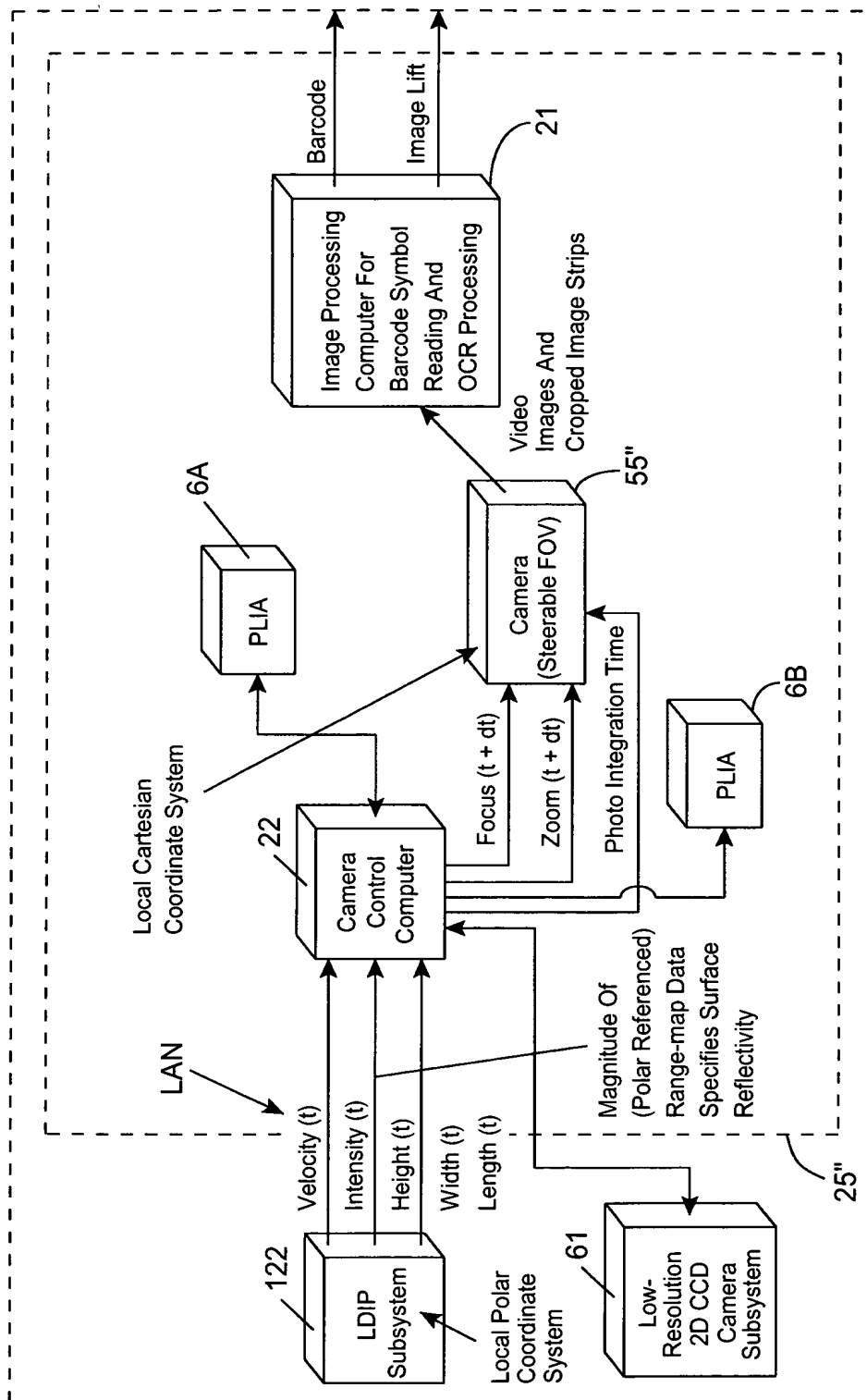


FIG. 26

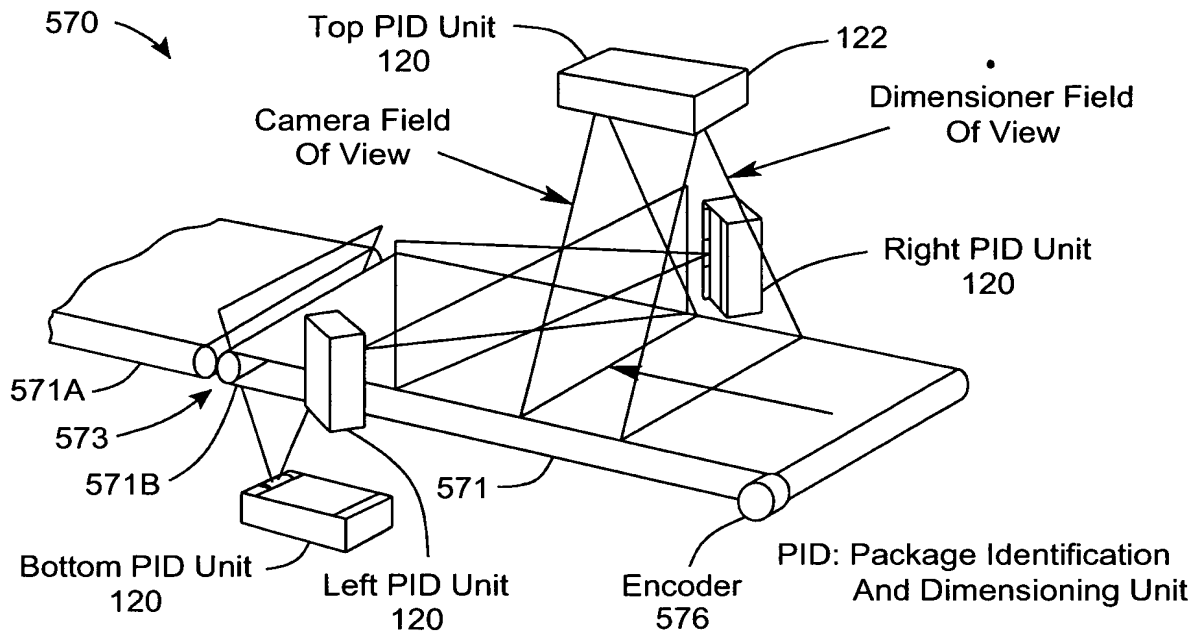


FIG. 27

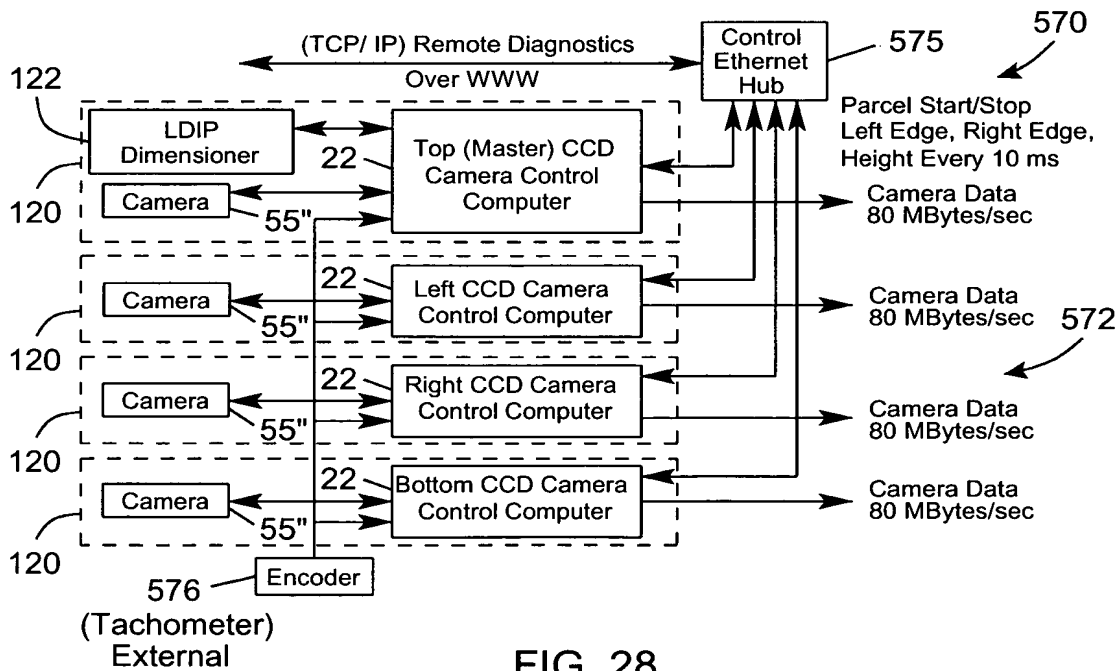


FIG. 28

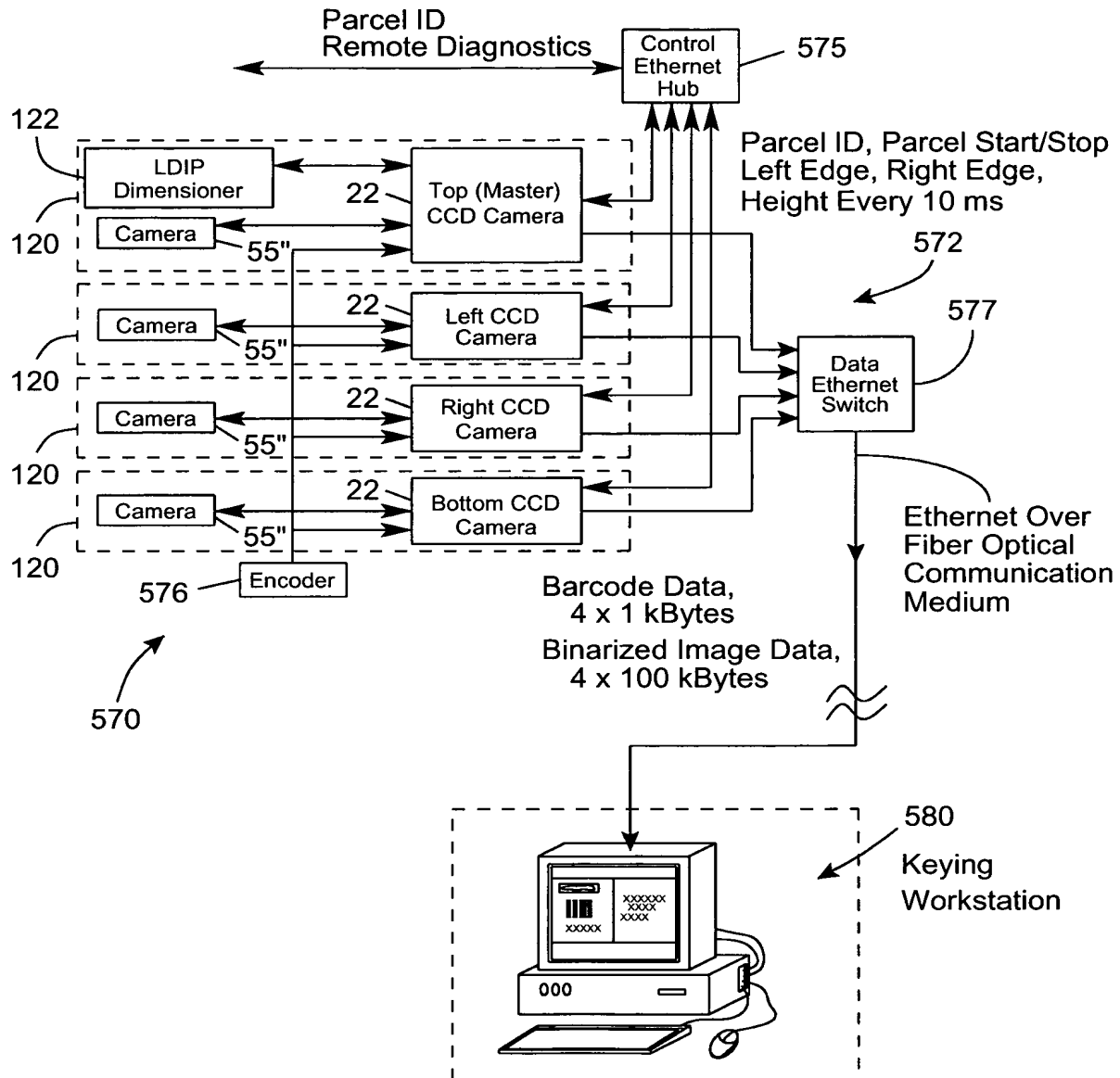


FIG. 29

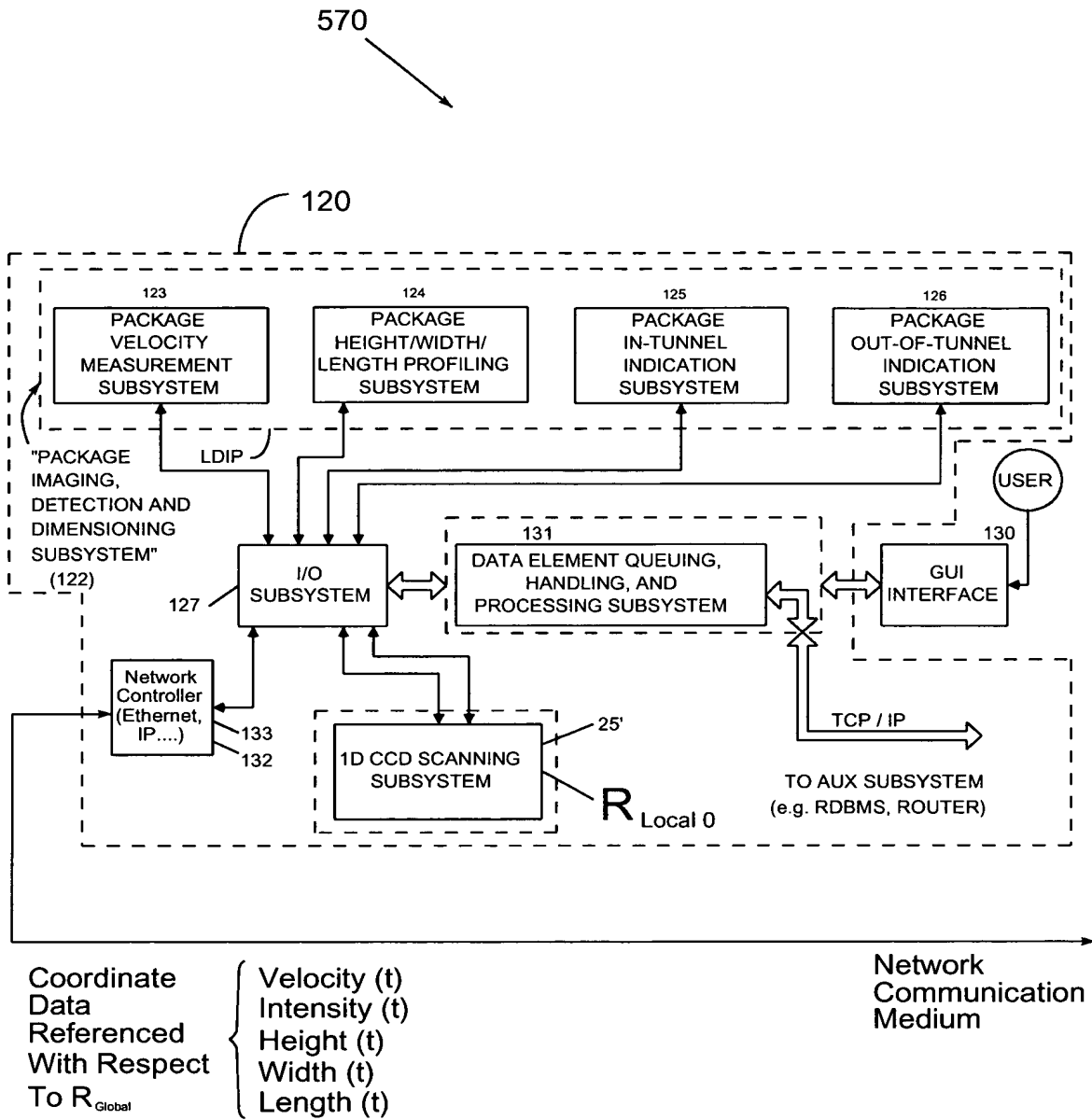


FIG. 30-1

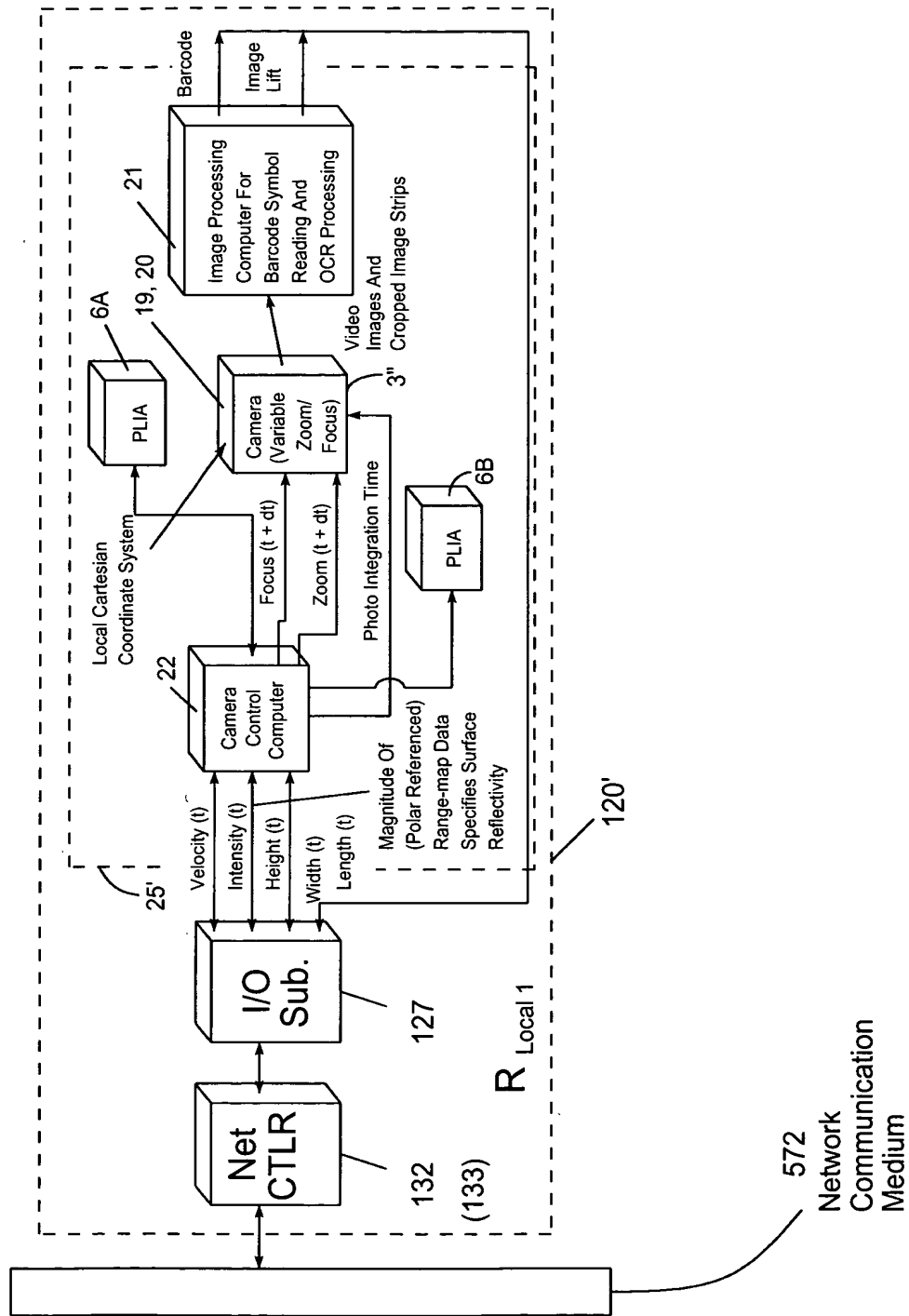


FIG. 30-2

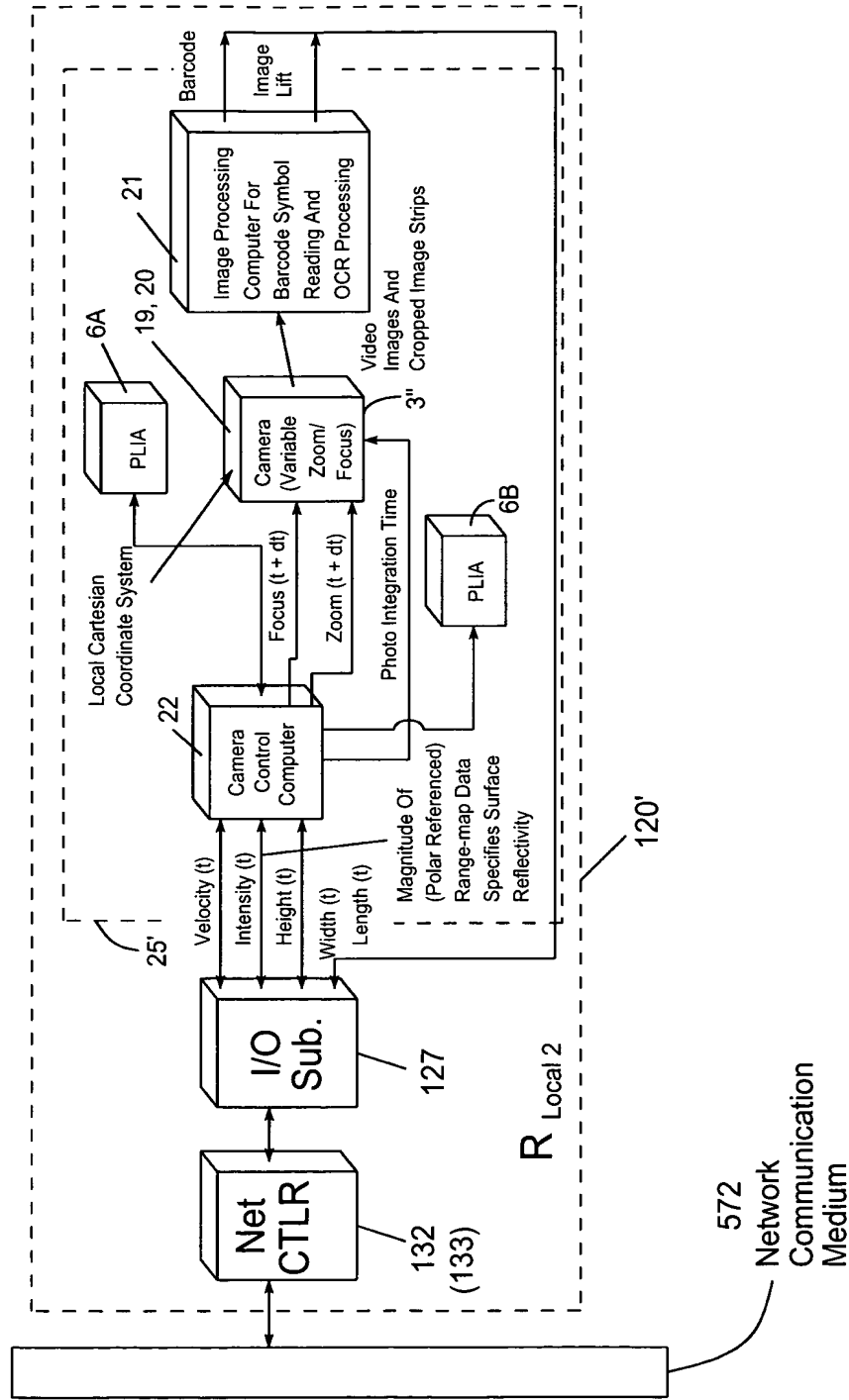
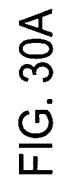
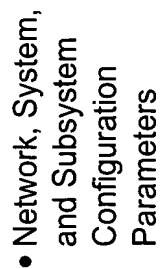


FIG. 30-3



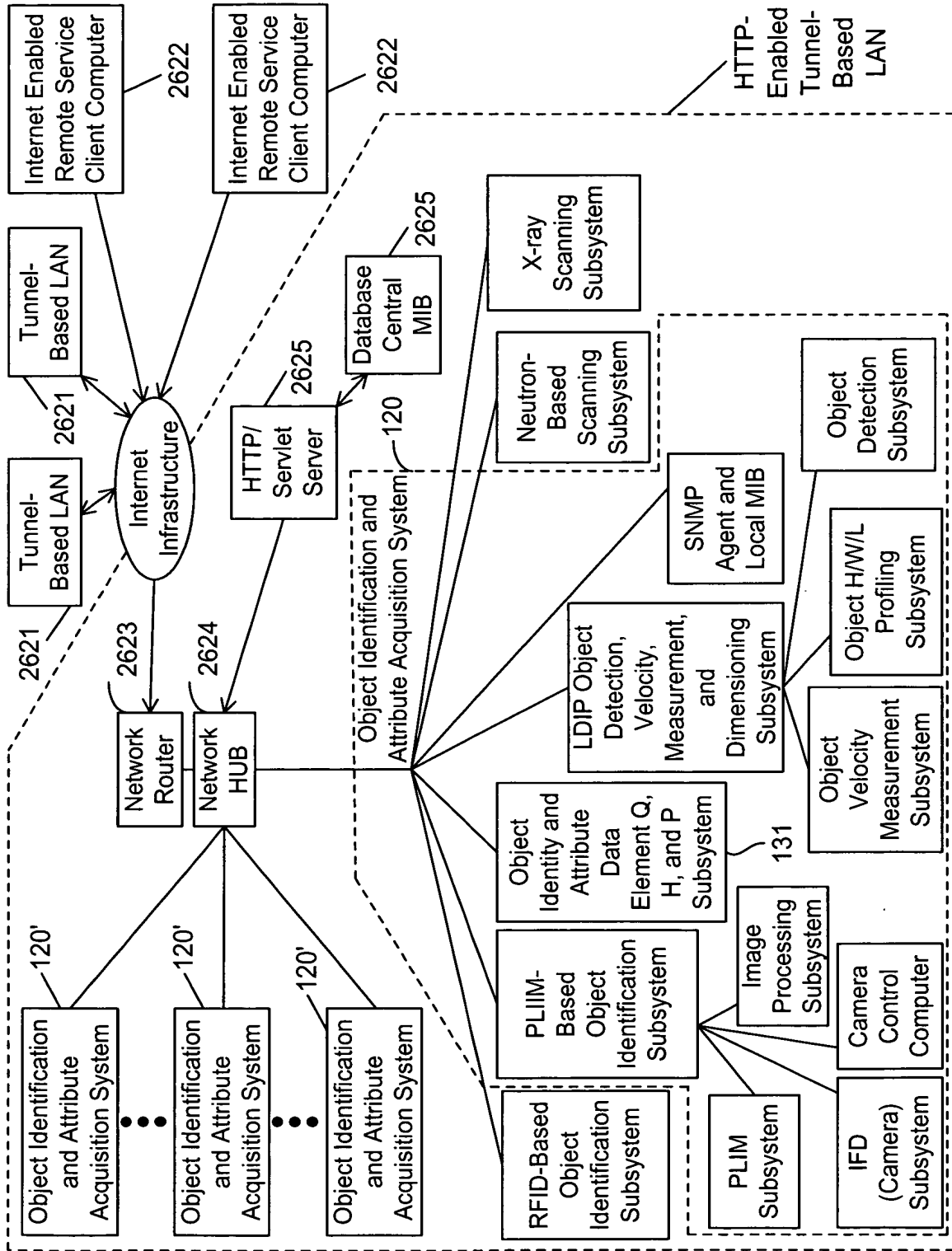


FIG. 30B



Network Configuration Parameters:

[Router IP address; no. of nodes (i.e. systems) in LAN; passwords, LAN location; name of customer facility; technical contact; phone no.; domain name; object identity codes; object attribute acquisition codes;.....]

System Configuration Parameters:

[System IP Address; passwords; object identity codes; object attribute acquisition codes;.....]

These subsystems generate object identity parameters

This system links object attribute data element parameters(i.e. object identity data element) to corresponding object identity parameters (i.e. object attribute data element)

These subsystems generate object attribute parameters

Monitorable and/or Configurable Parameters for Subsystems Within Each System:

- PLIIM-based object identification subsystem: [object identity code; object attribute acquisition codes;.....]
 - PLIIM Subsystem: [VLD status; power VLD; TIM function; temp.;.....]
 - IFD (Camera) Subsystem: [sensor temp;]
 - Image Processing Subsystem (Computer): [processor load history; system up time; # of frames (pgs); barcode read rate; current line rate;.....]
 - Camera Contact Subsystem (Computer): [number of frames dropped; number of focused zoom commands; number and kinds of motor control errors;.....]
- RFID-based object identification subsystem: [....]
 - Object identity and attribute data element queuing, handling and processing subsystem: [....]
- LDIP object identification, velocity-measurement, and dimensioning subsystem: [....]
 - Object velocity measurement subsystem: [polygon RPM; polygon laser output X; channel X drift; channel X noise; trigger error events; instant lock reference drift; temperature]
 - Object H/W/L profiling subsystem
 - Object detection subsystem: [non- singulation/ singulation code;.....]
- X-ray scanning subsystem: [....]
- Neutron-beam scanning subsystem: [....]

FIG. 30C

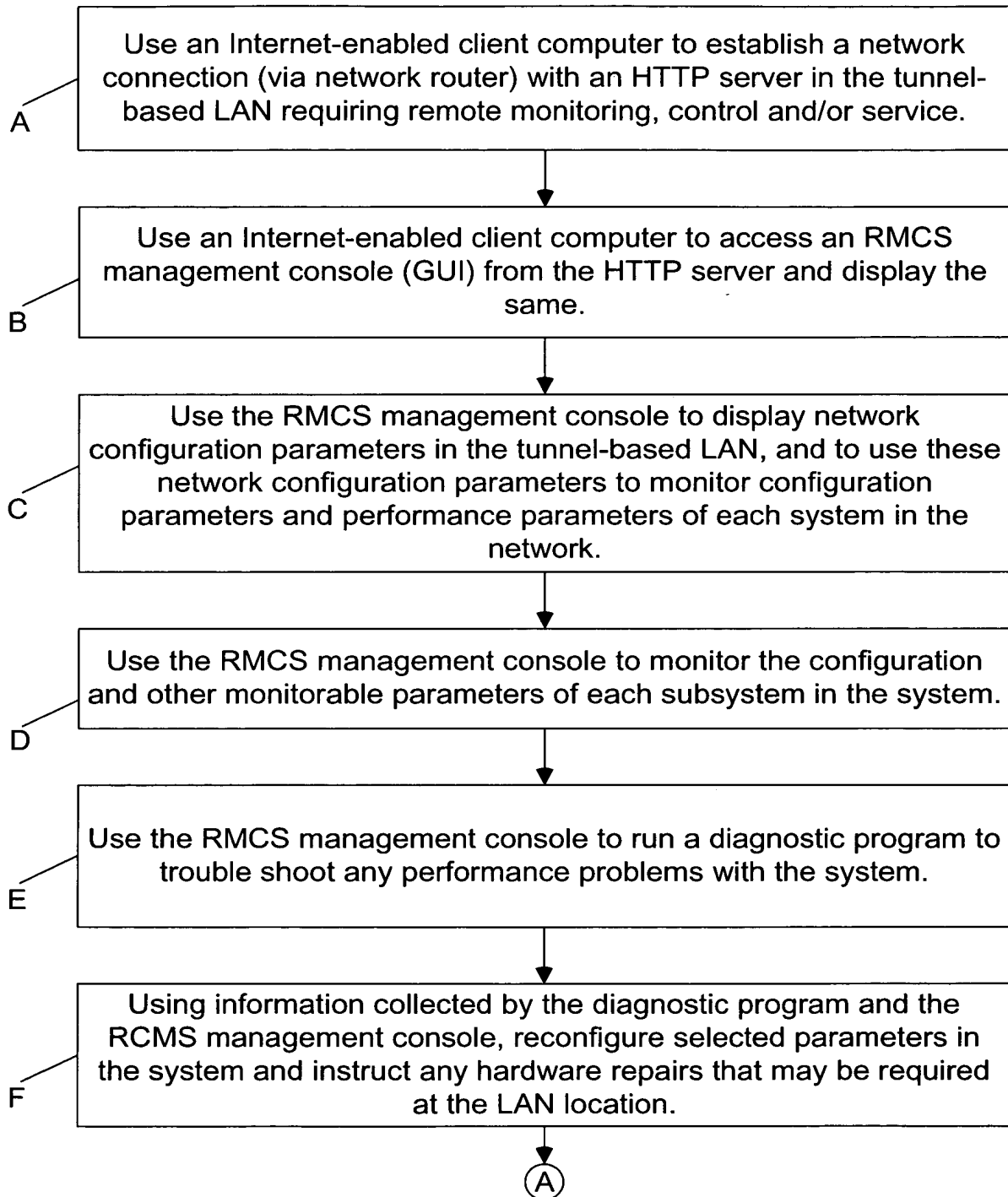


FIG. 30D1

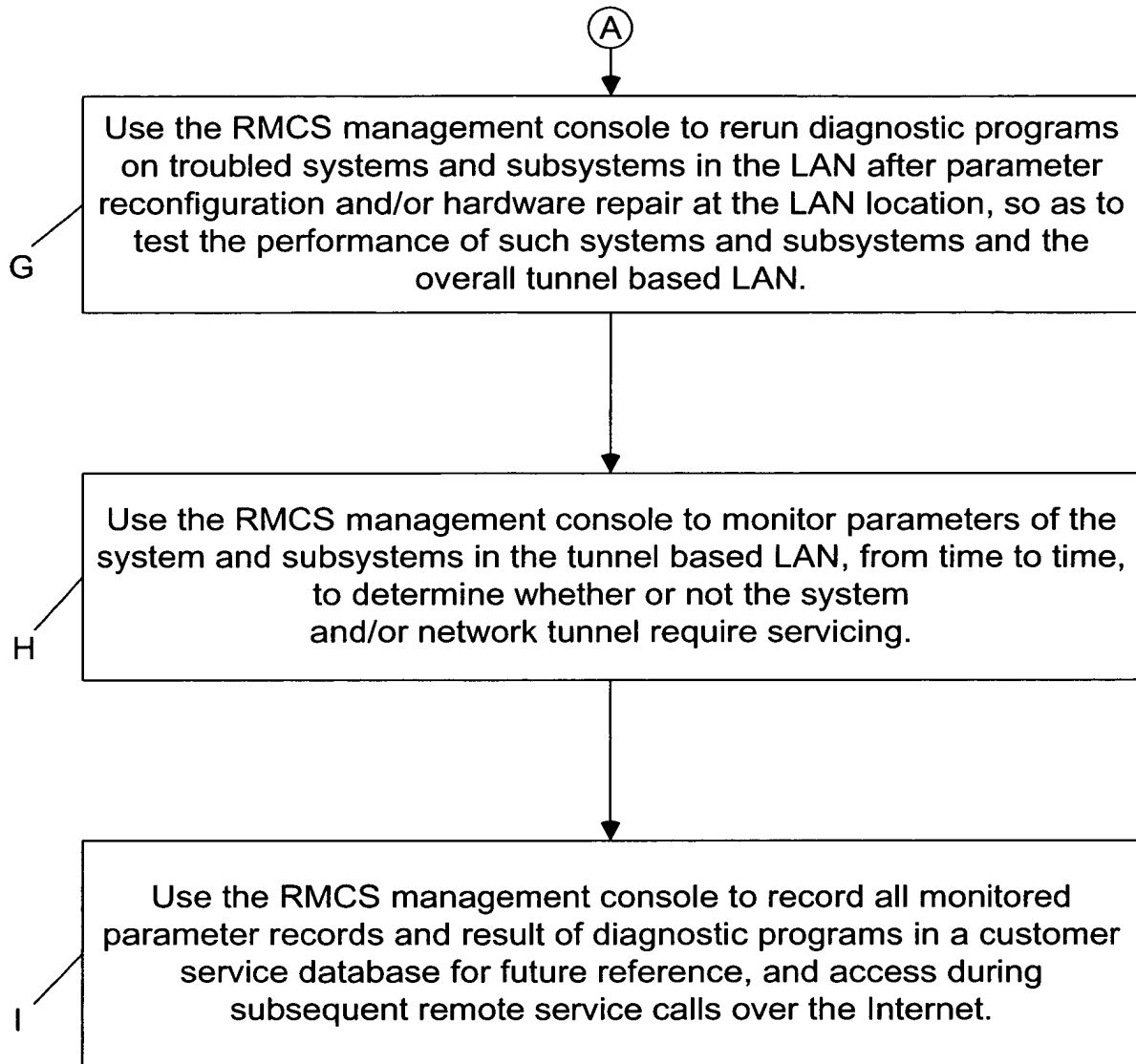


FIG. 30D2

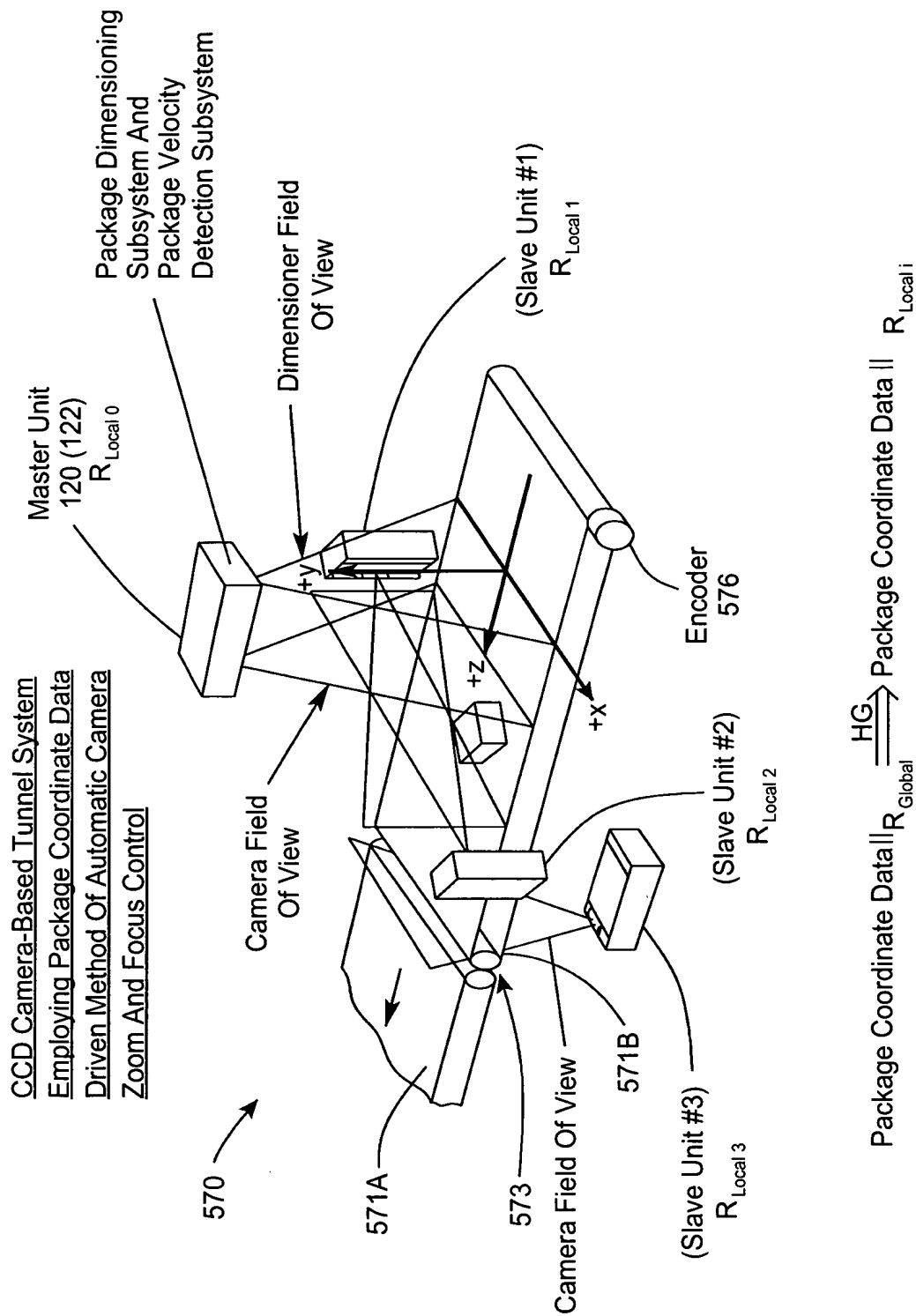


FIG. 31

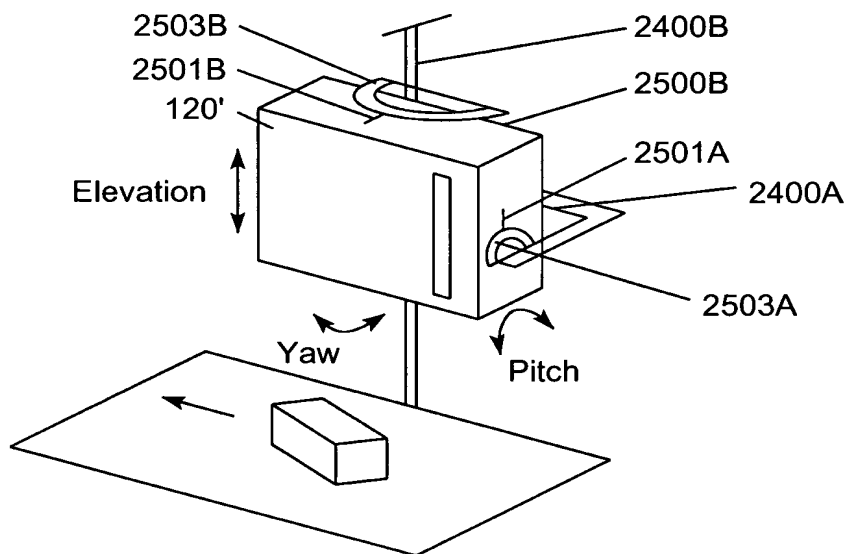


FIG. 31A

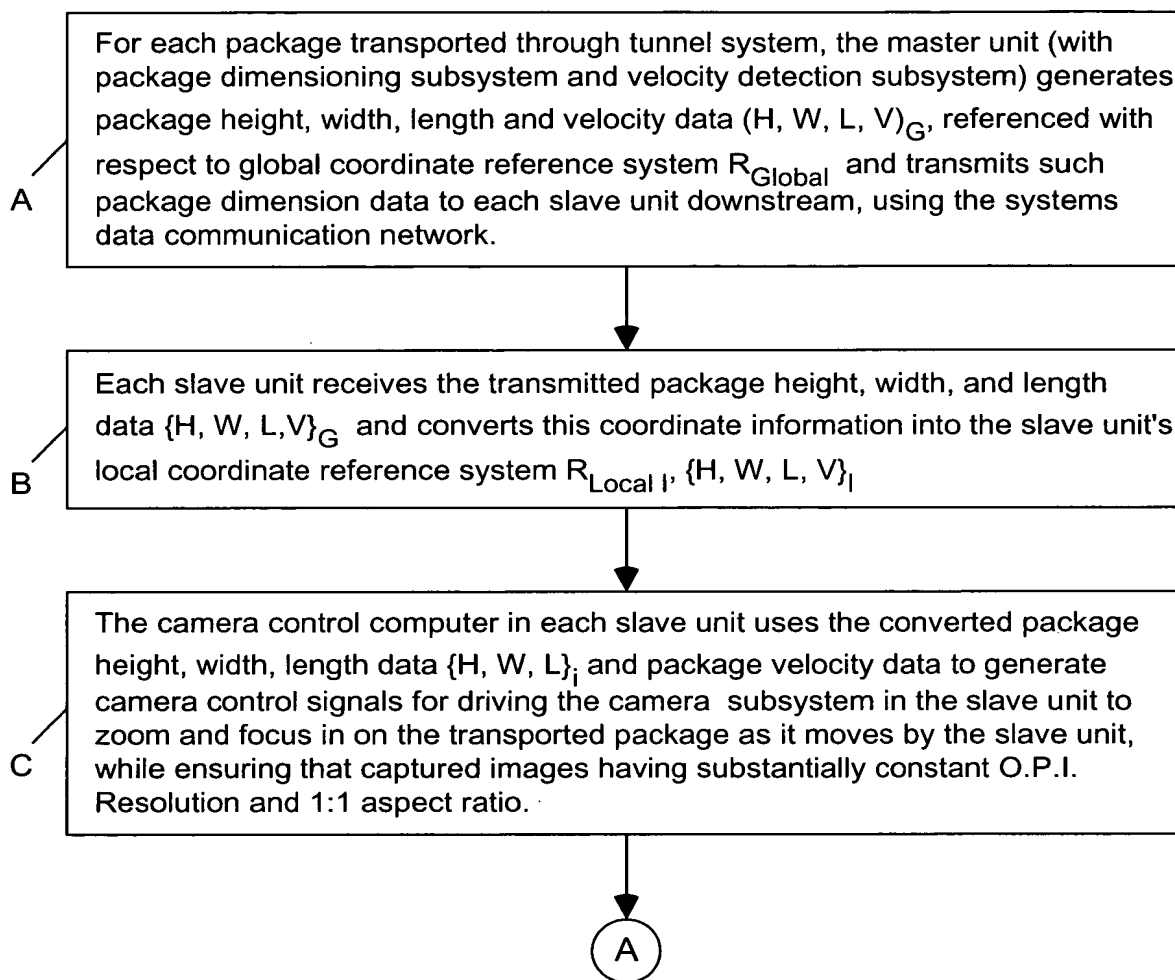


FIG. 32A

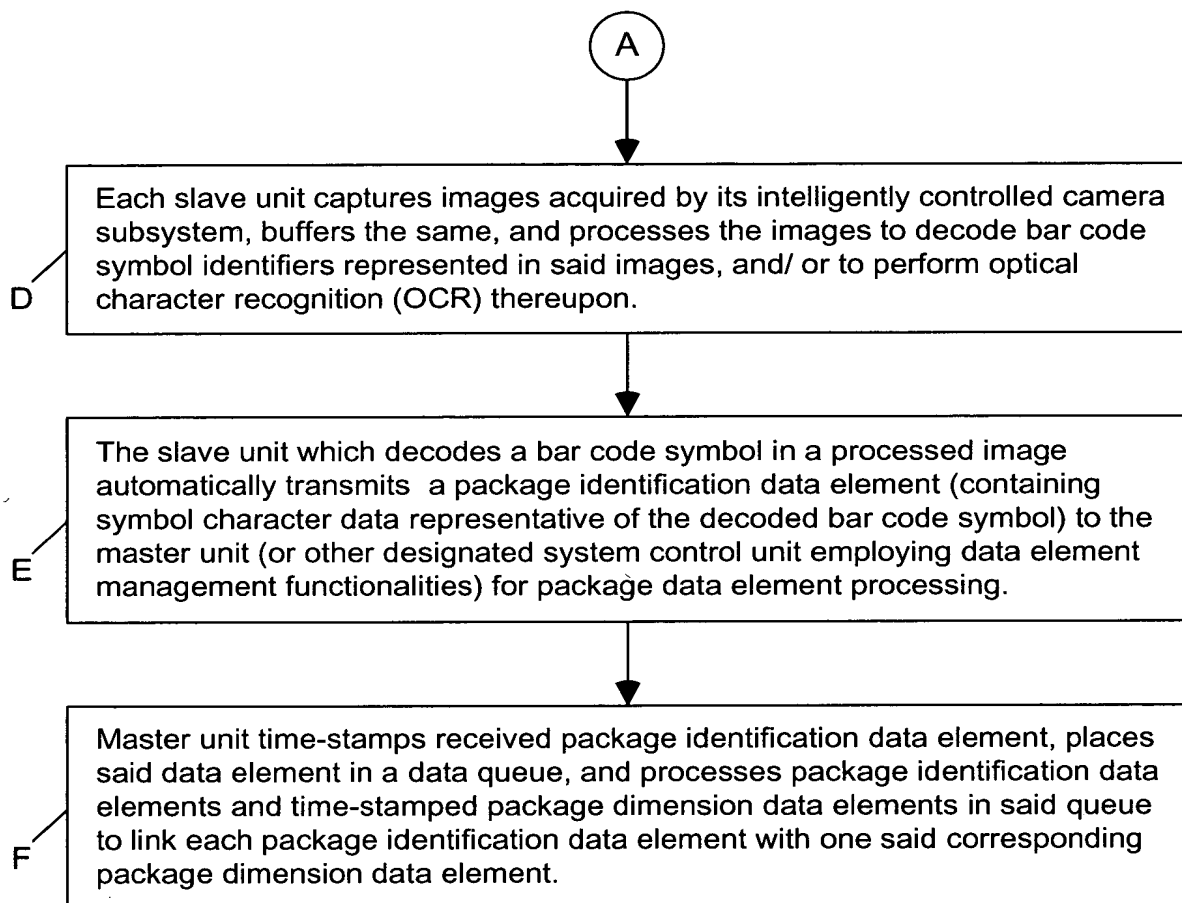


FIG. 32B

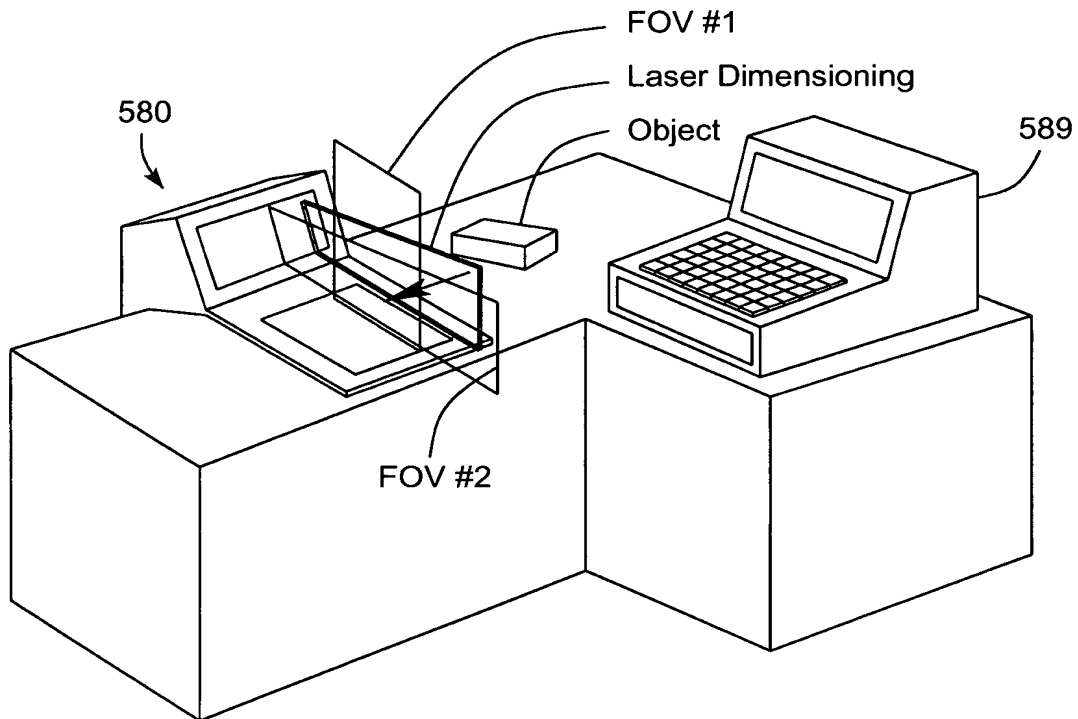


FIG. 33A

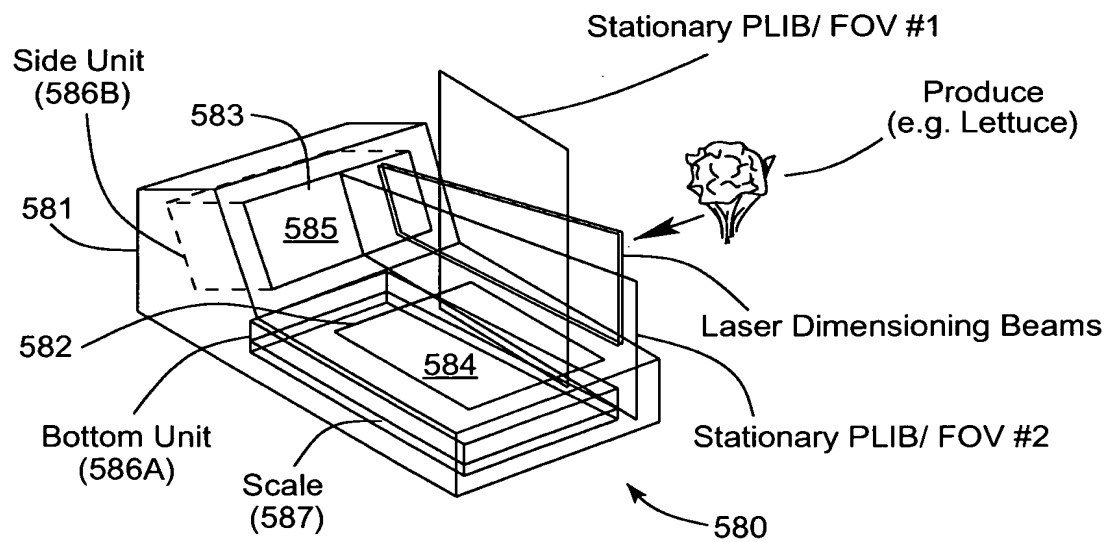


FIG. 33B

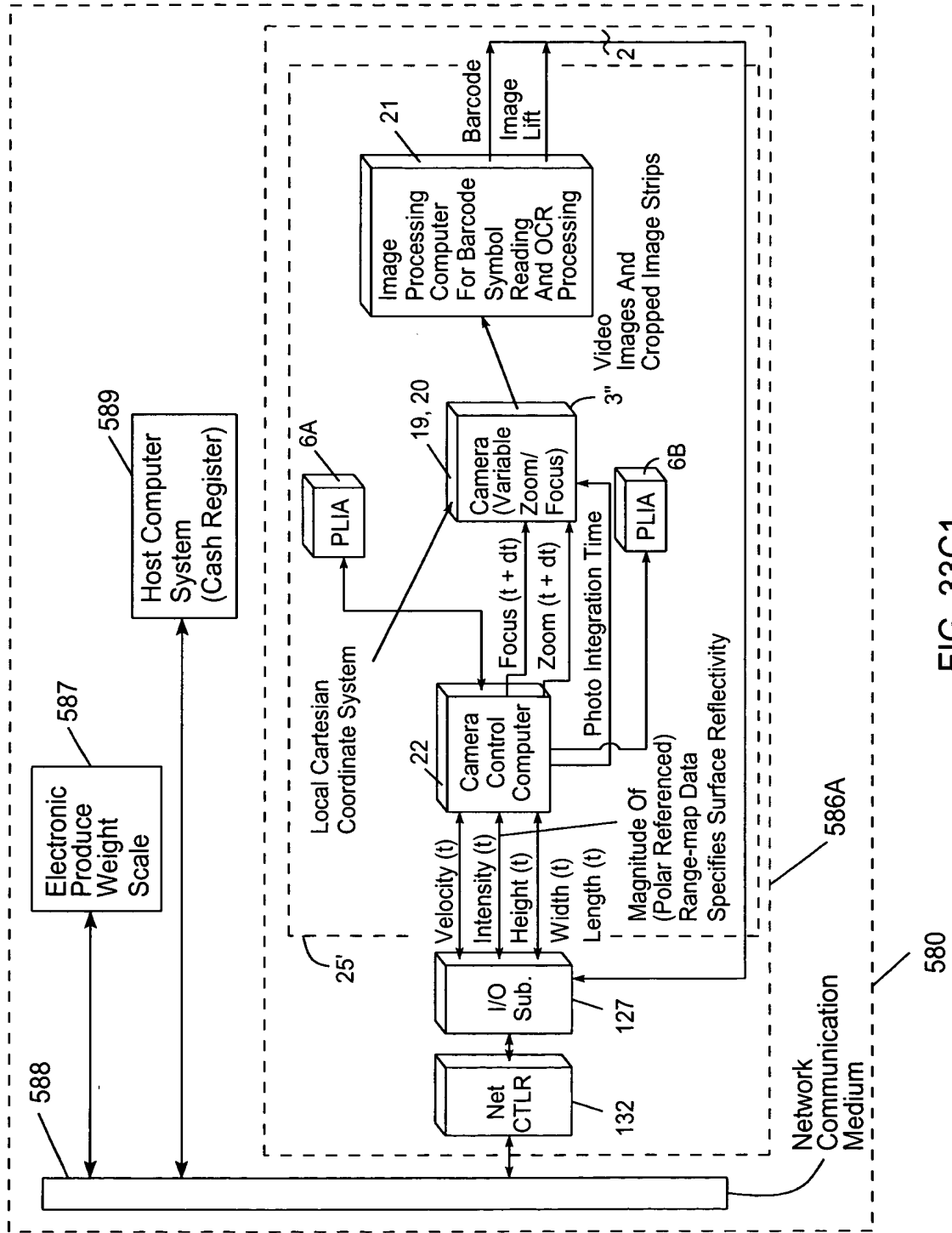


FIG. 33C1

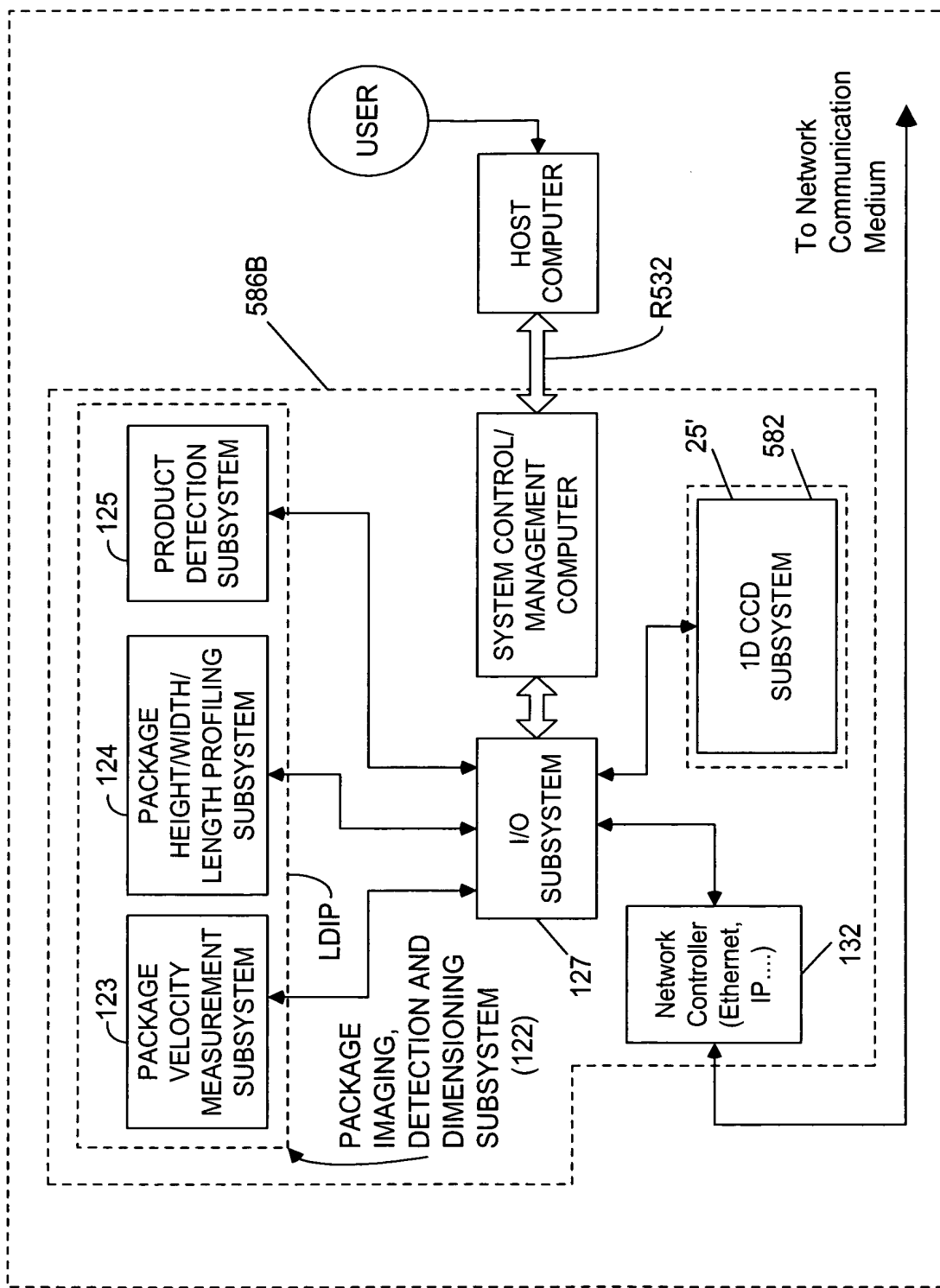


FIG. 33C2

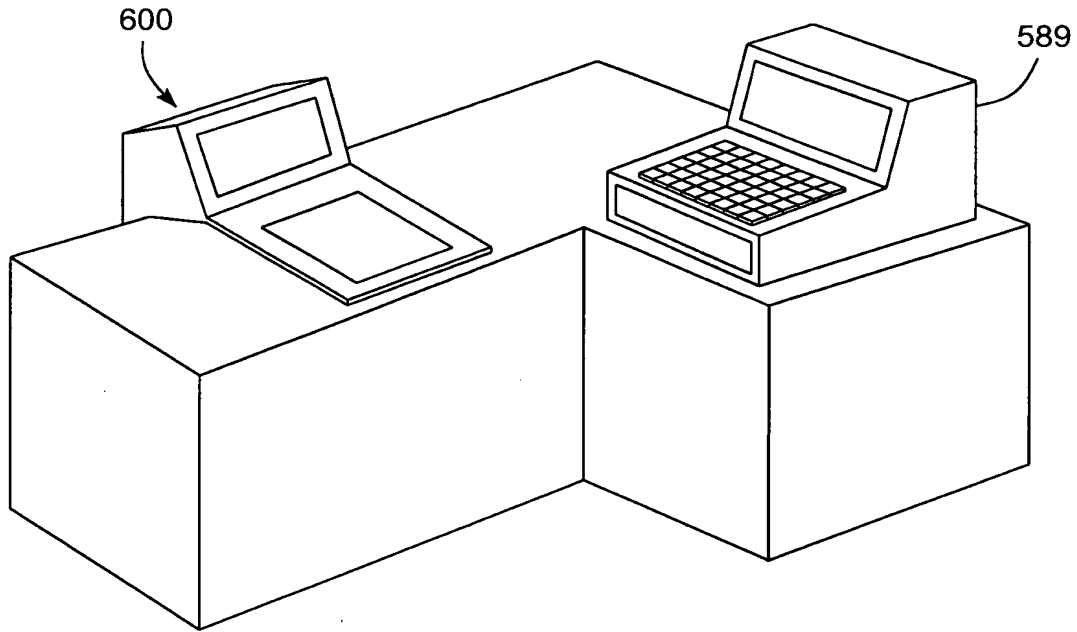


FIG. 34A

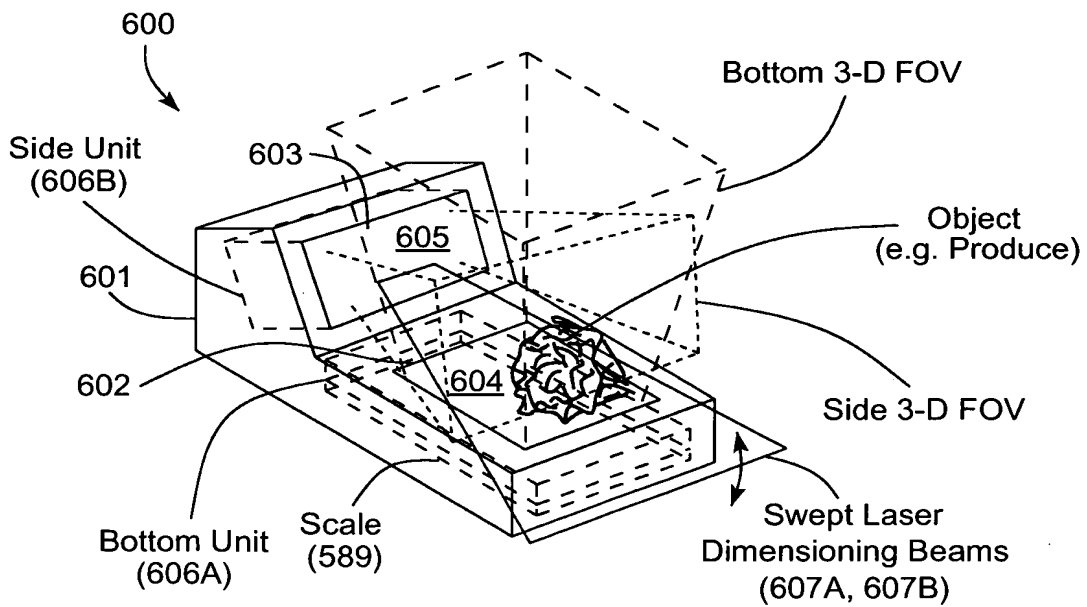


FIG. 34B

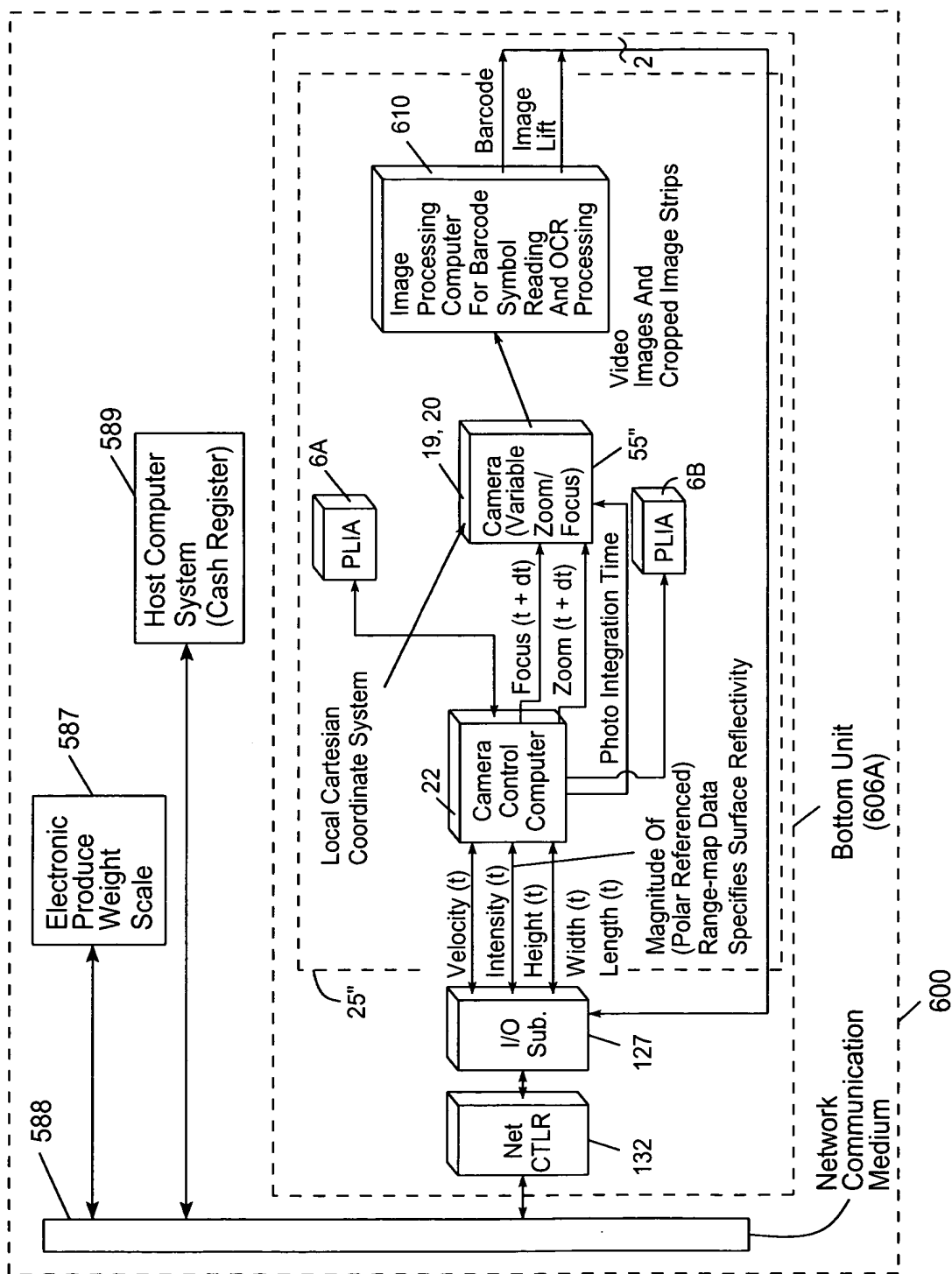


FIG. 34C1

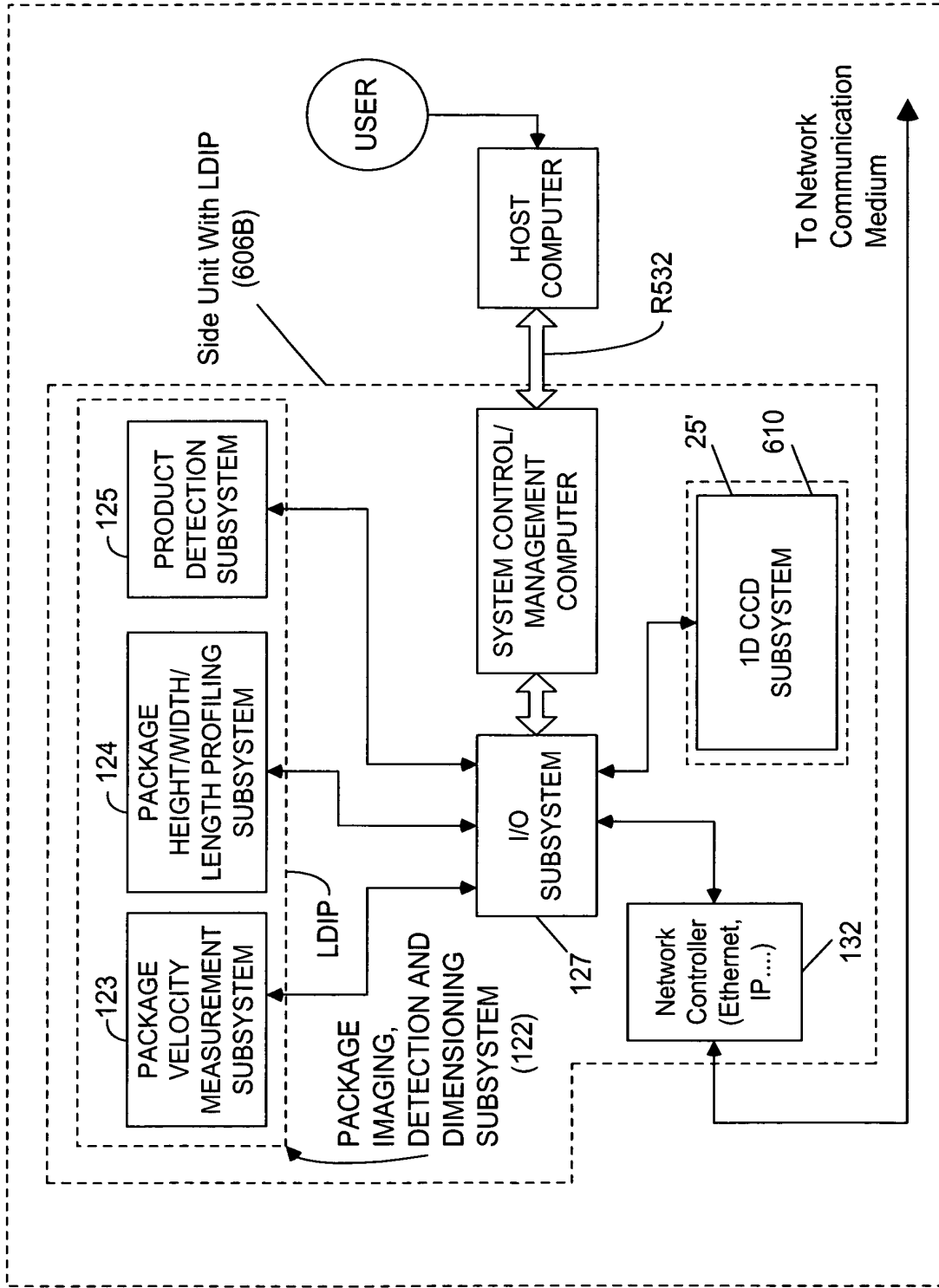


FIG. 34C2

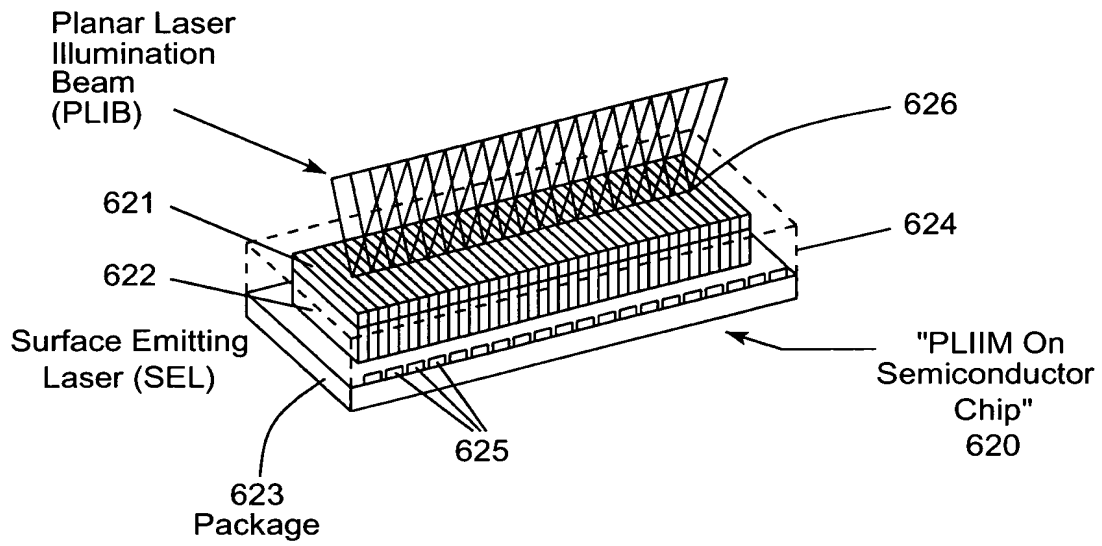


FIG. 35A

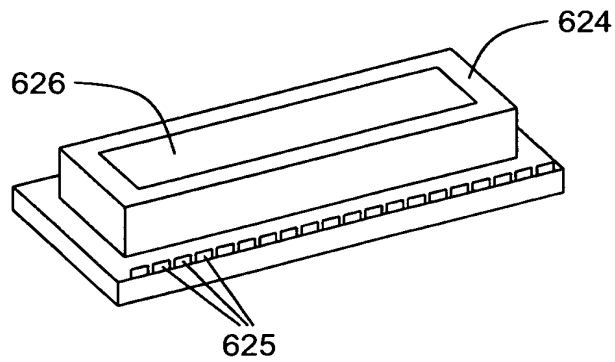


FIG. 35B

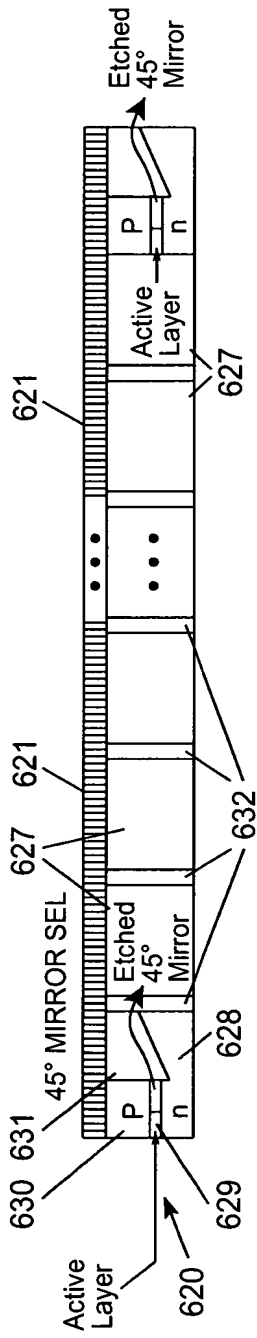


FIG. 36A

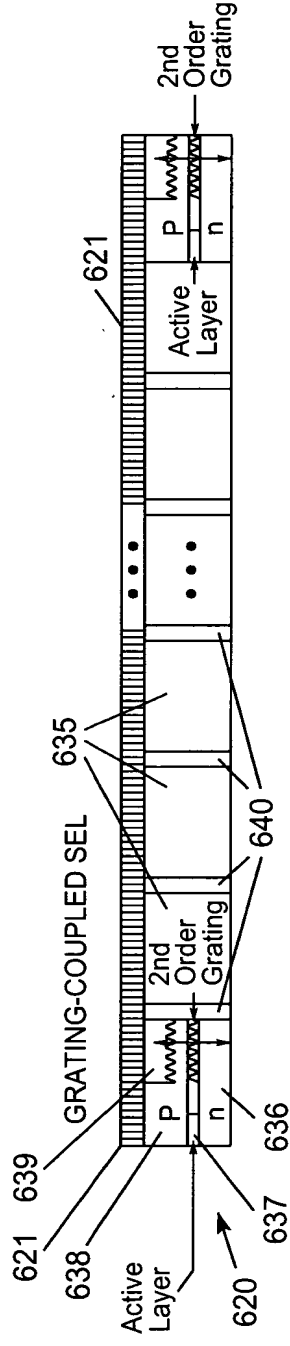


FIG. 36B

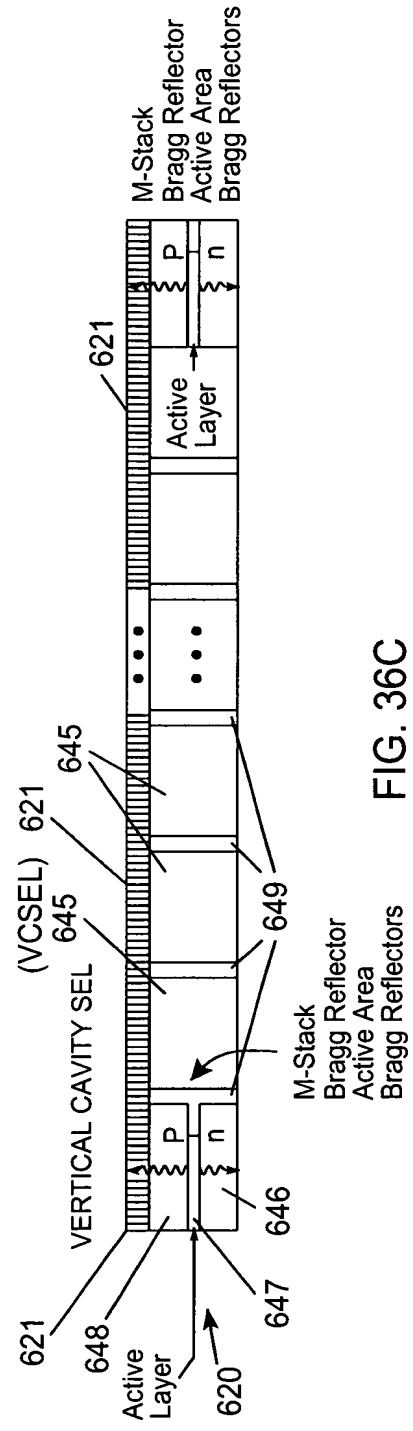


FIG. 36C

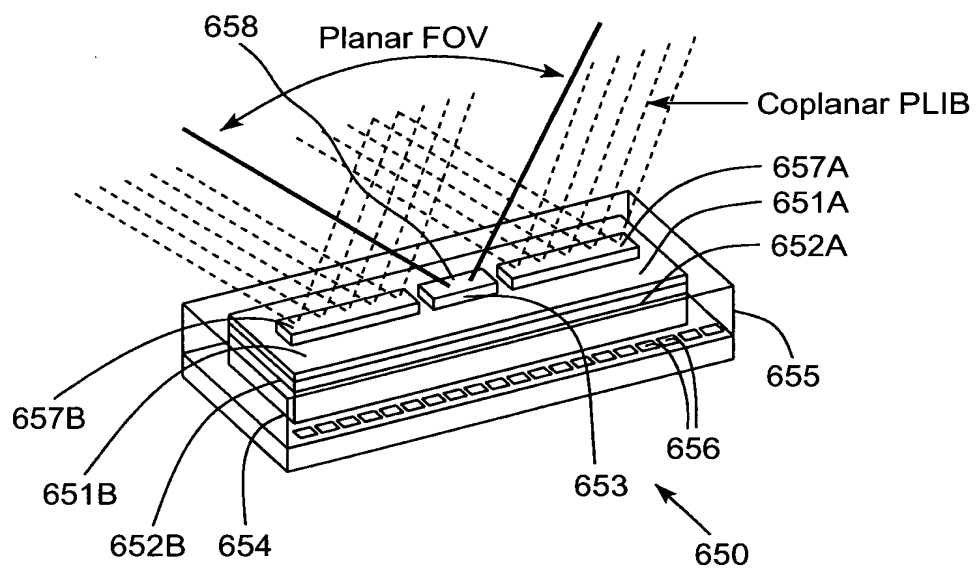


FIG. 37

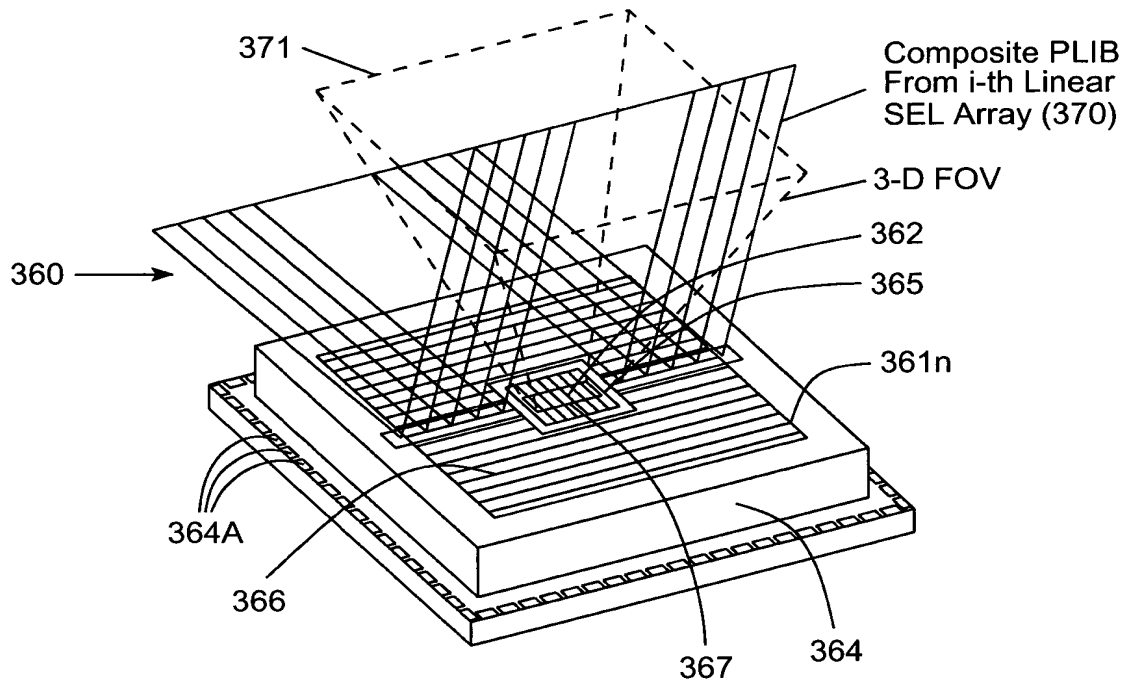


FIG. 38A

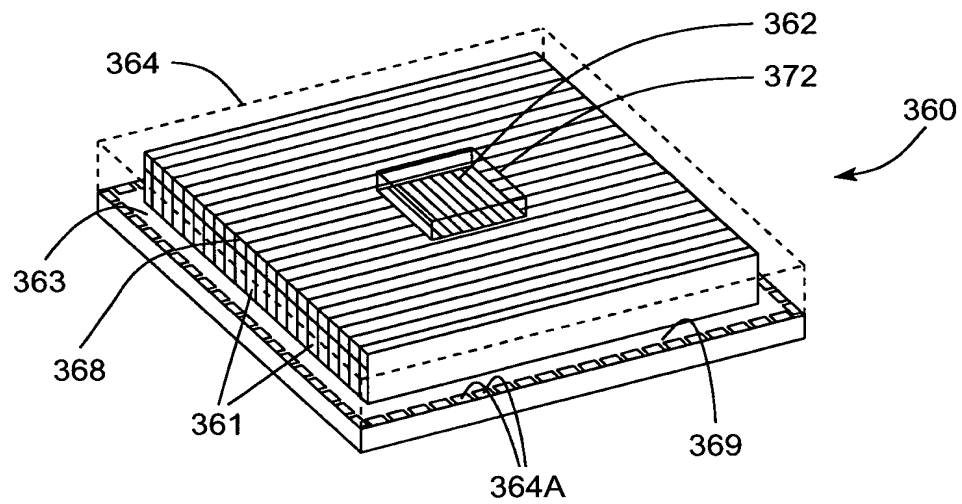


FIG. 38B

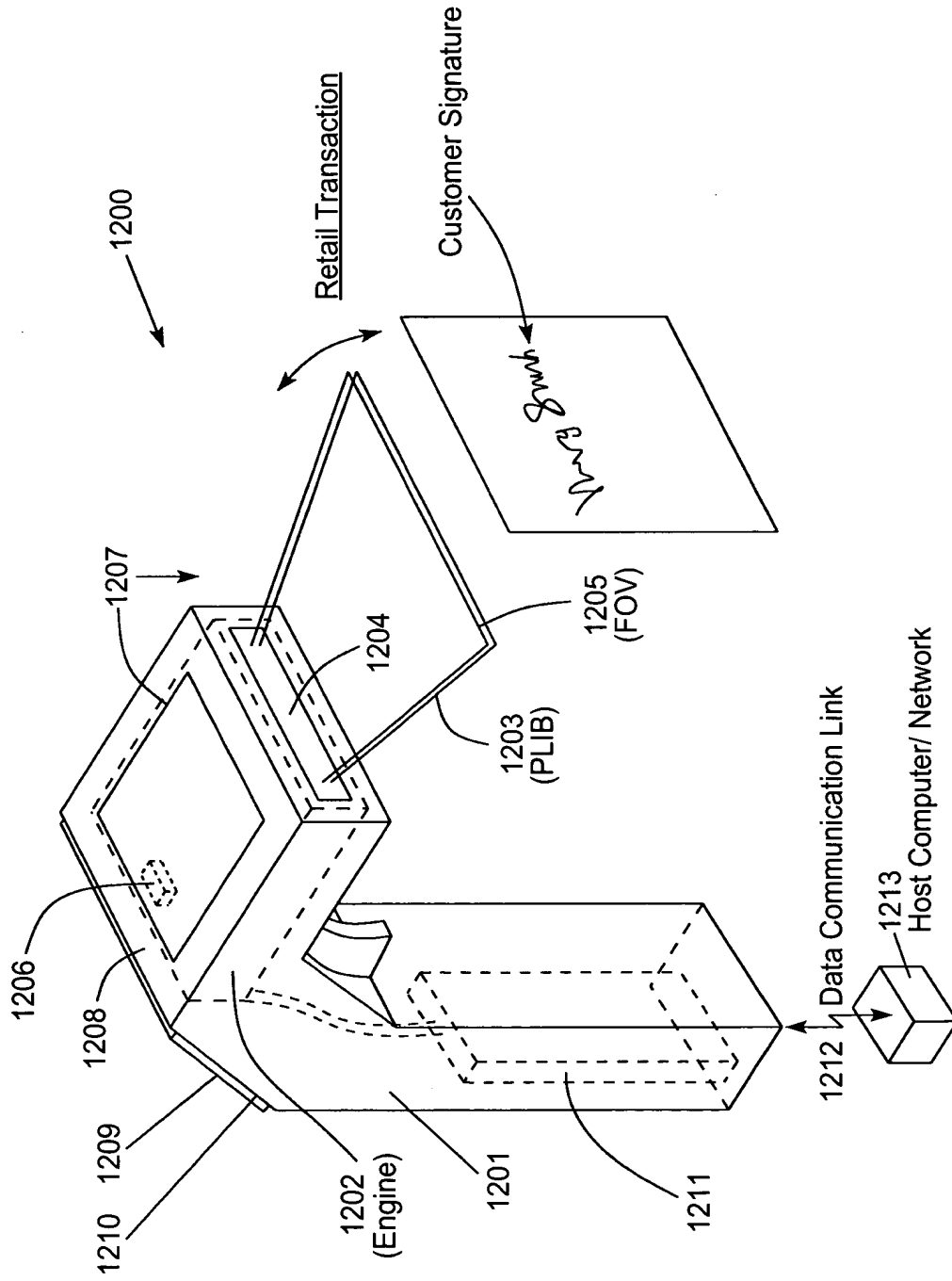


FIG. 39A

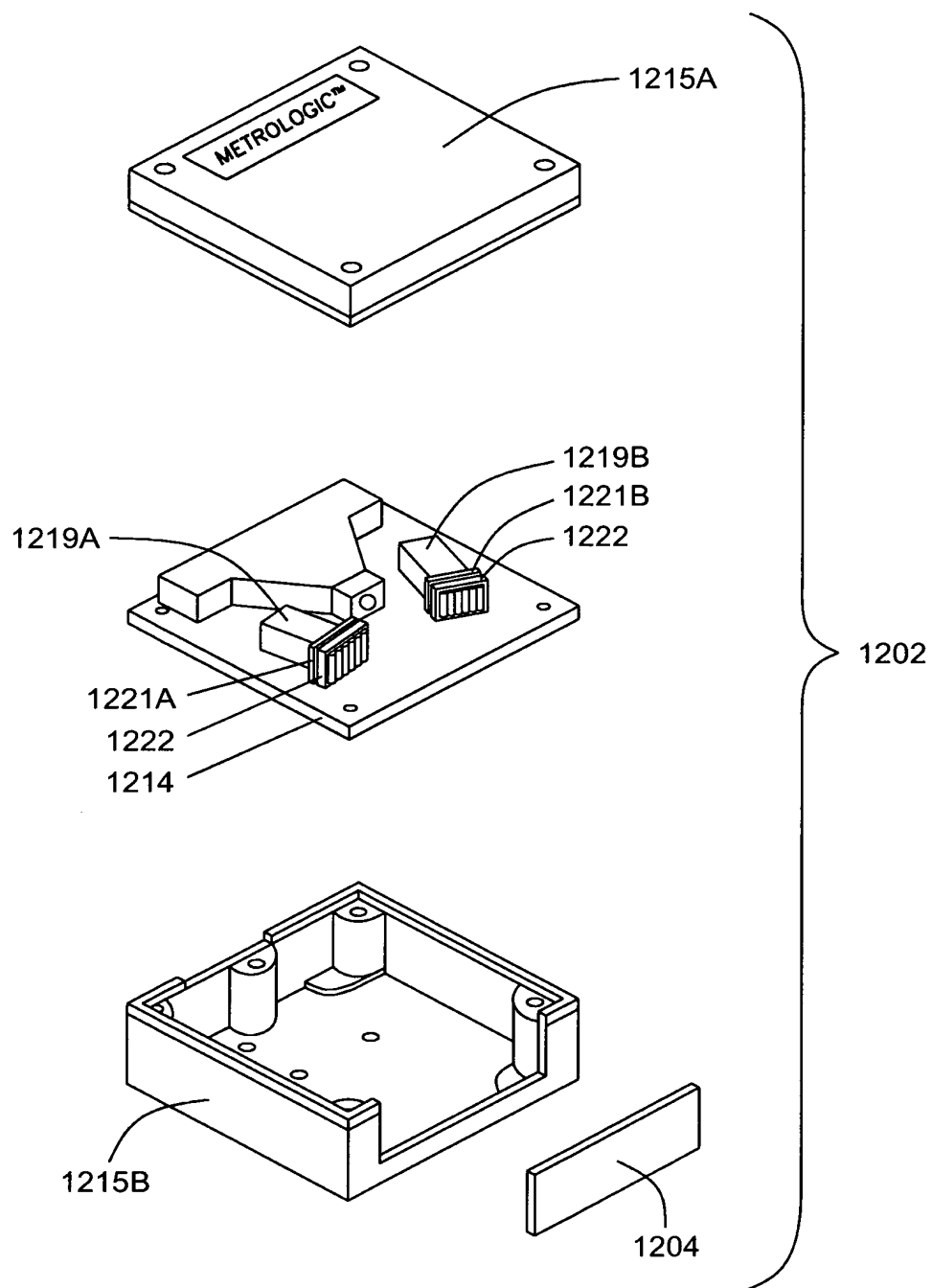


FIG. 39B

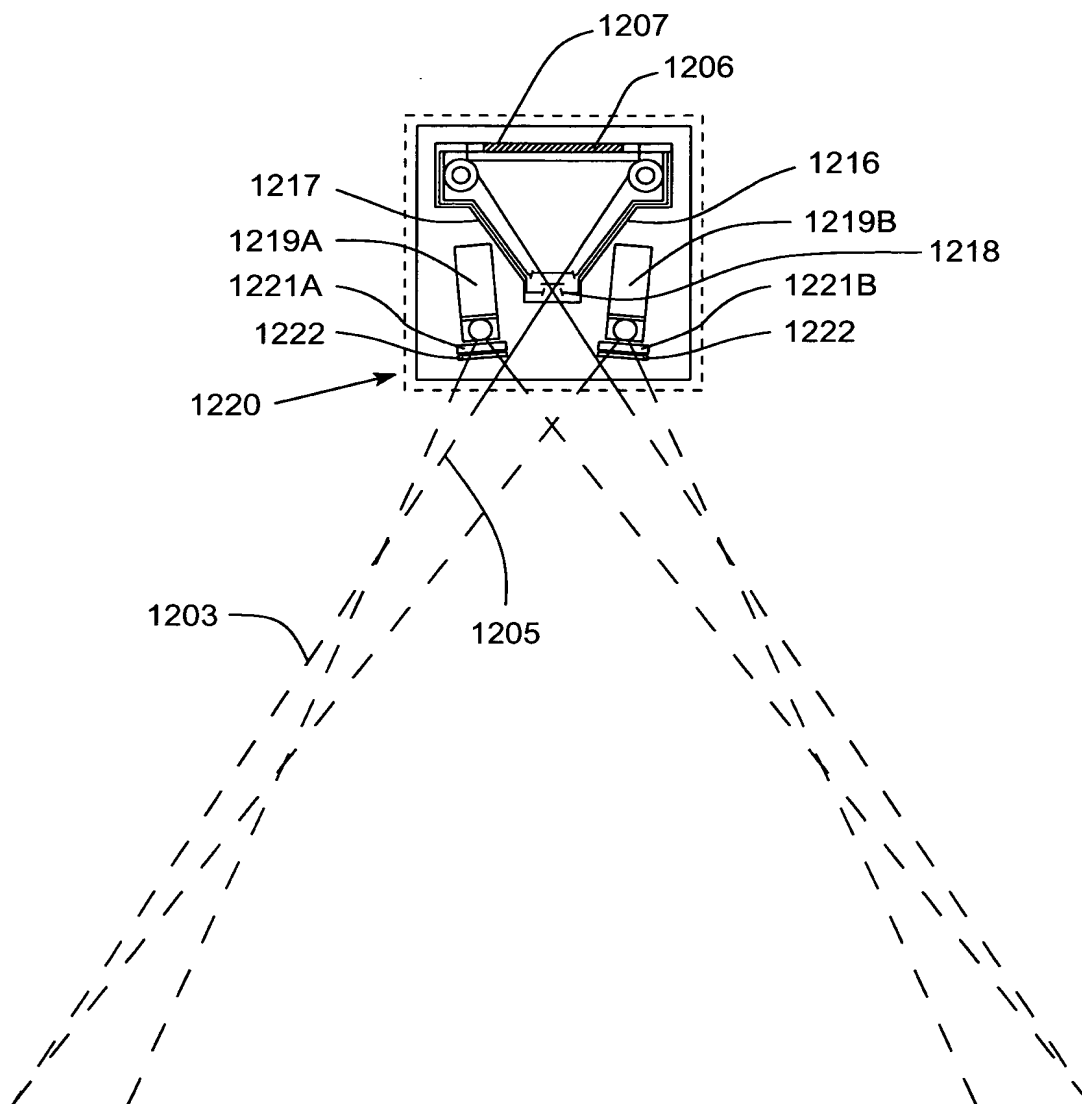


FIG. 39C

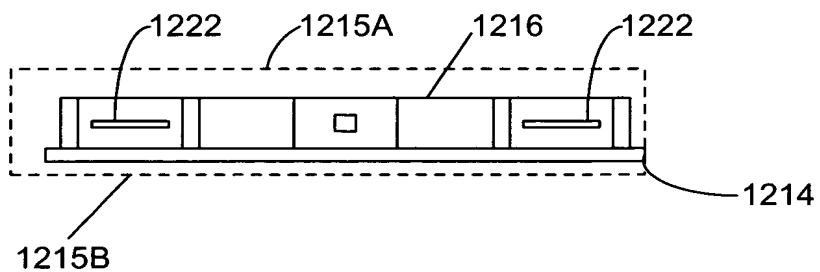


FIG. 39D

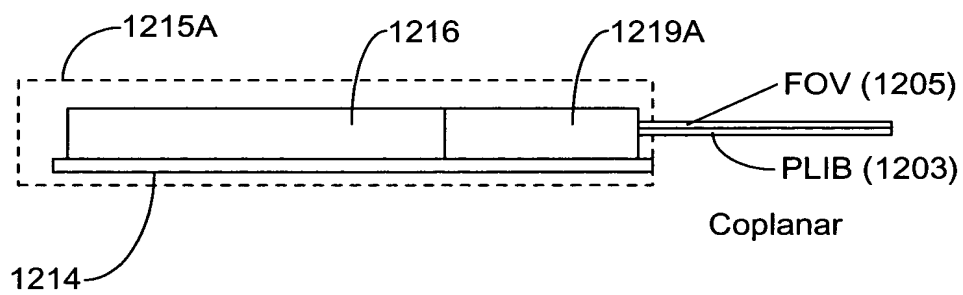


FIG. 39E

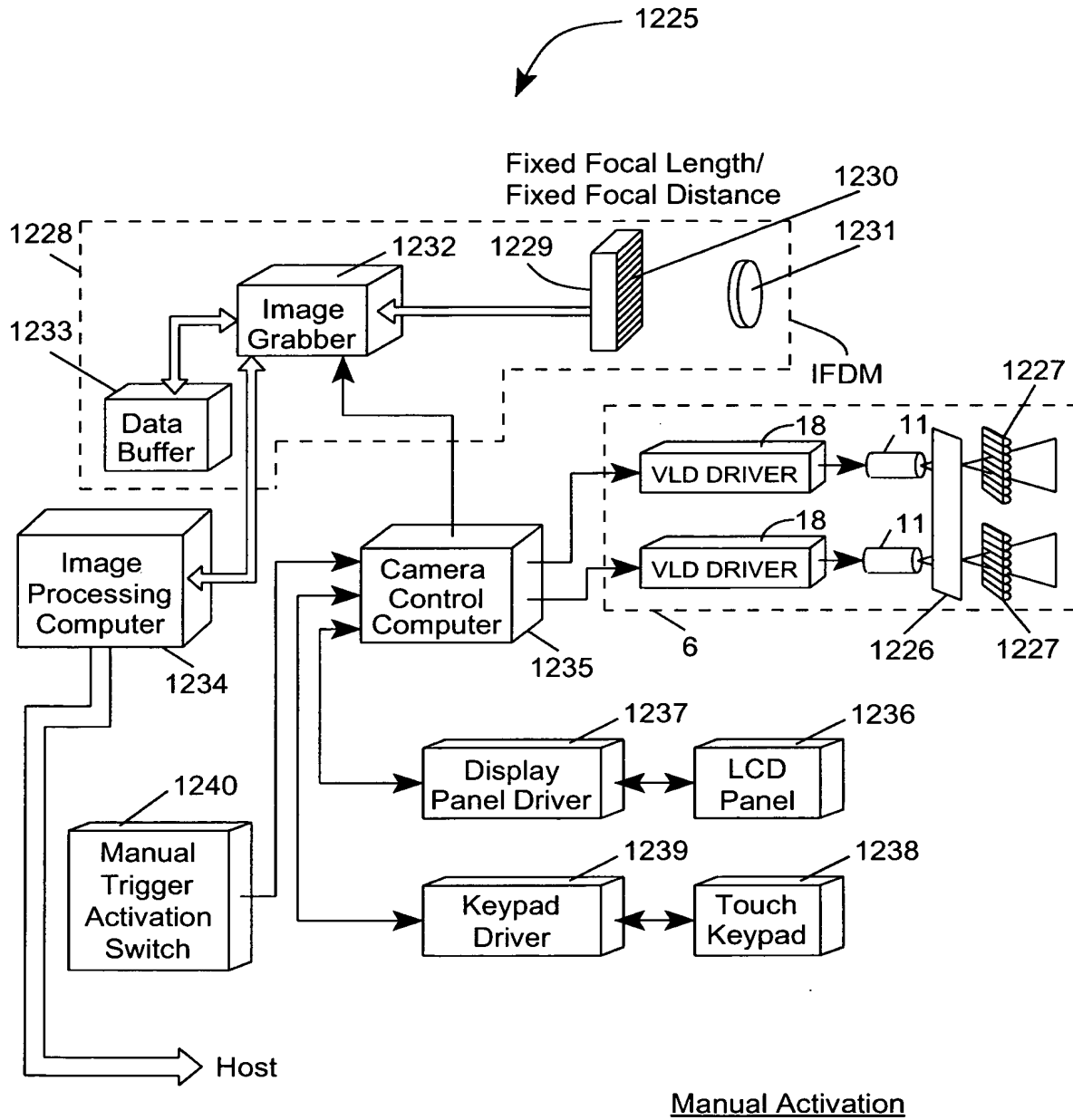
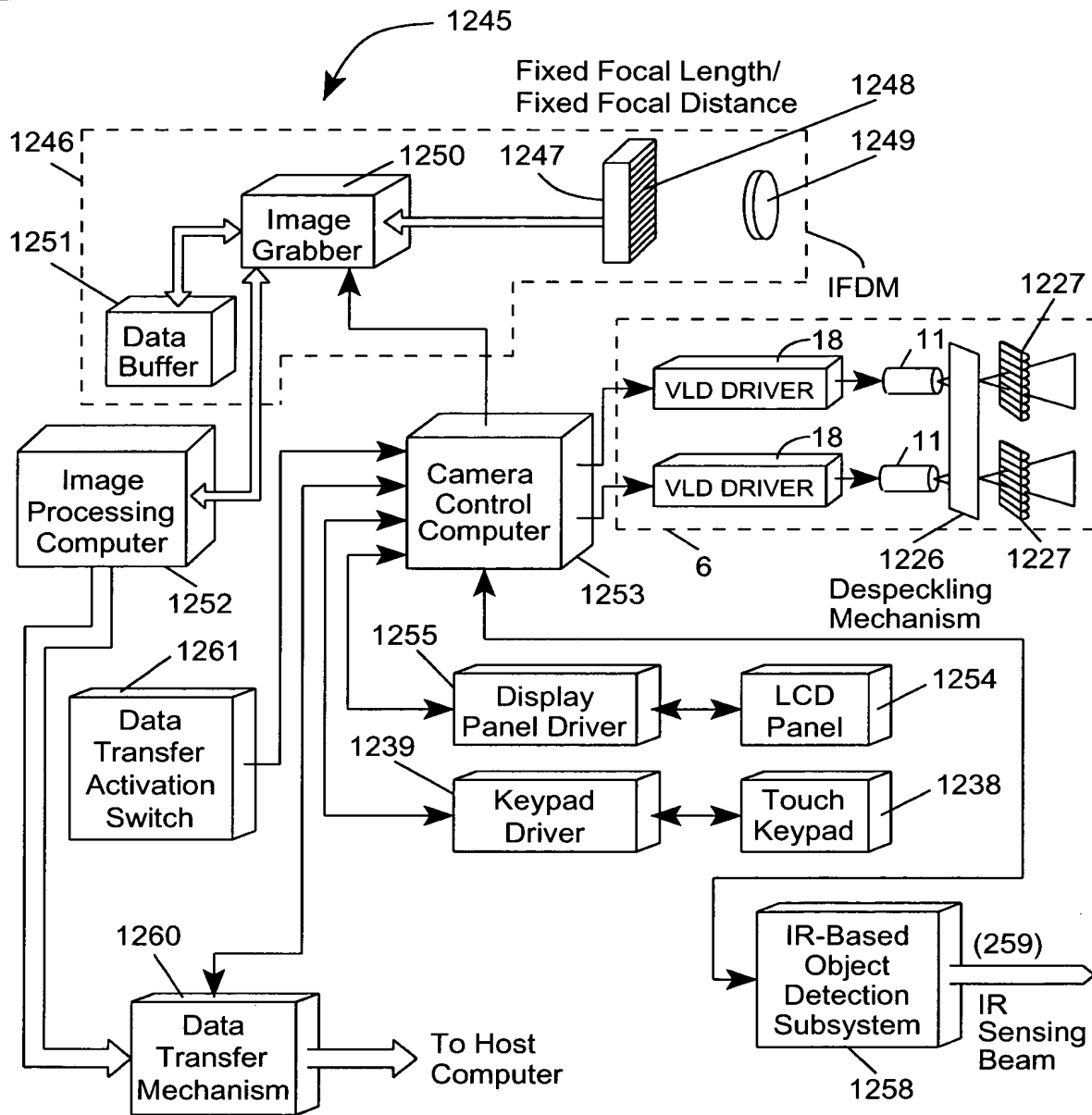
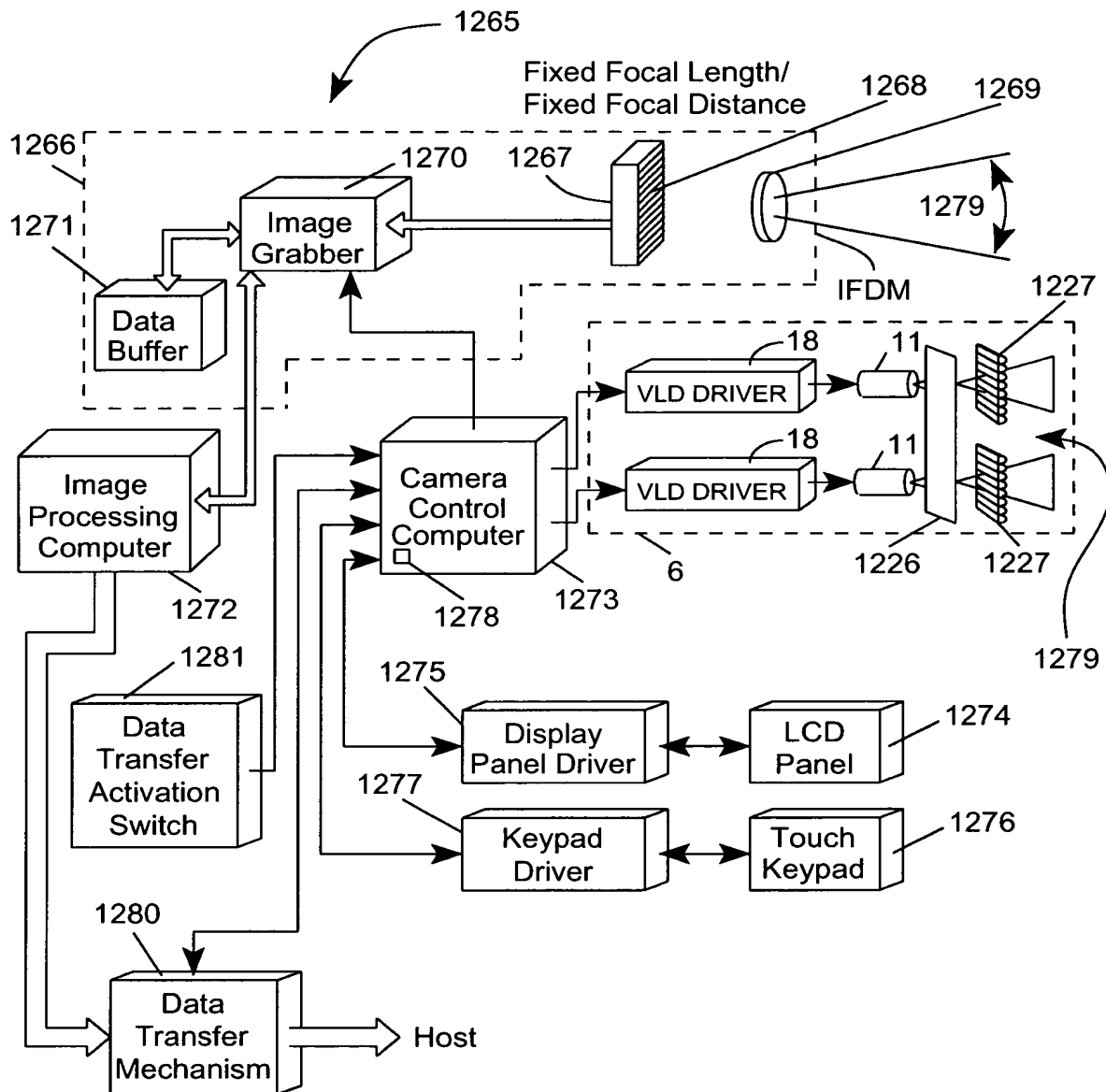


FIG. 40A1



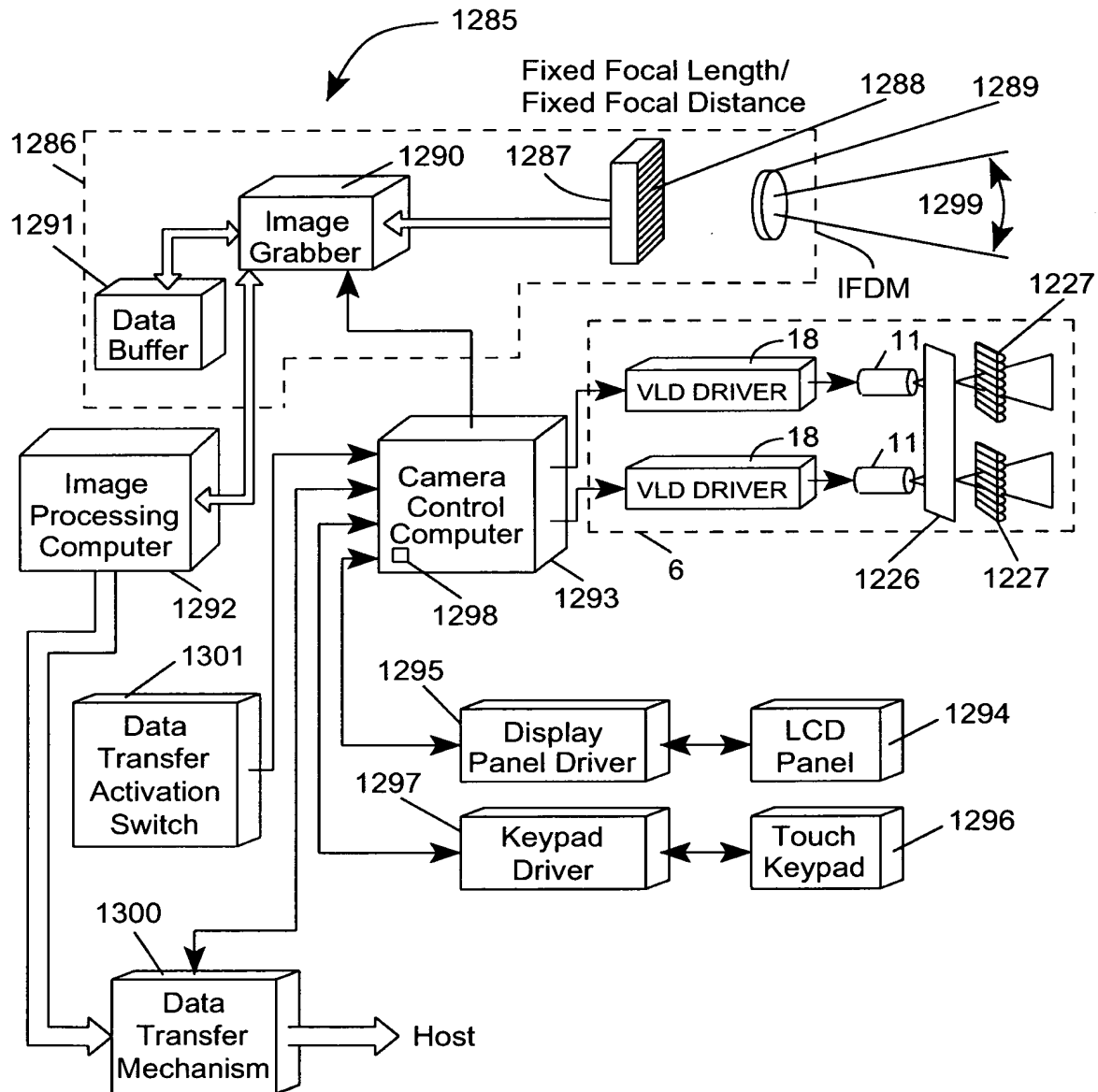
Automatic with IR Object Detection

FIG. 40A2



Automatic with Laser Based Object Detection

FIG. 40A3



Automatic with Passive CCD
Based Object Detection

FIG. 40A4

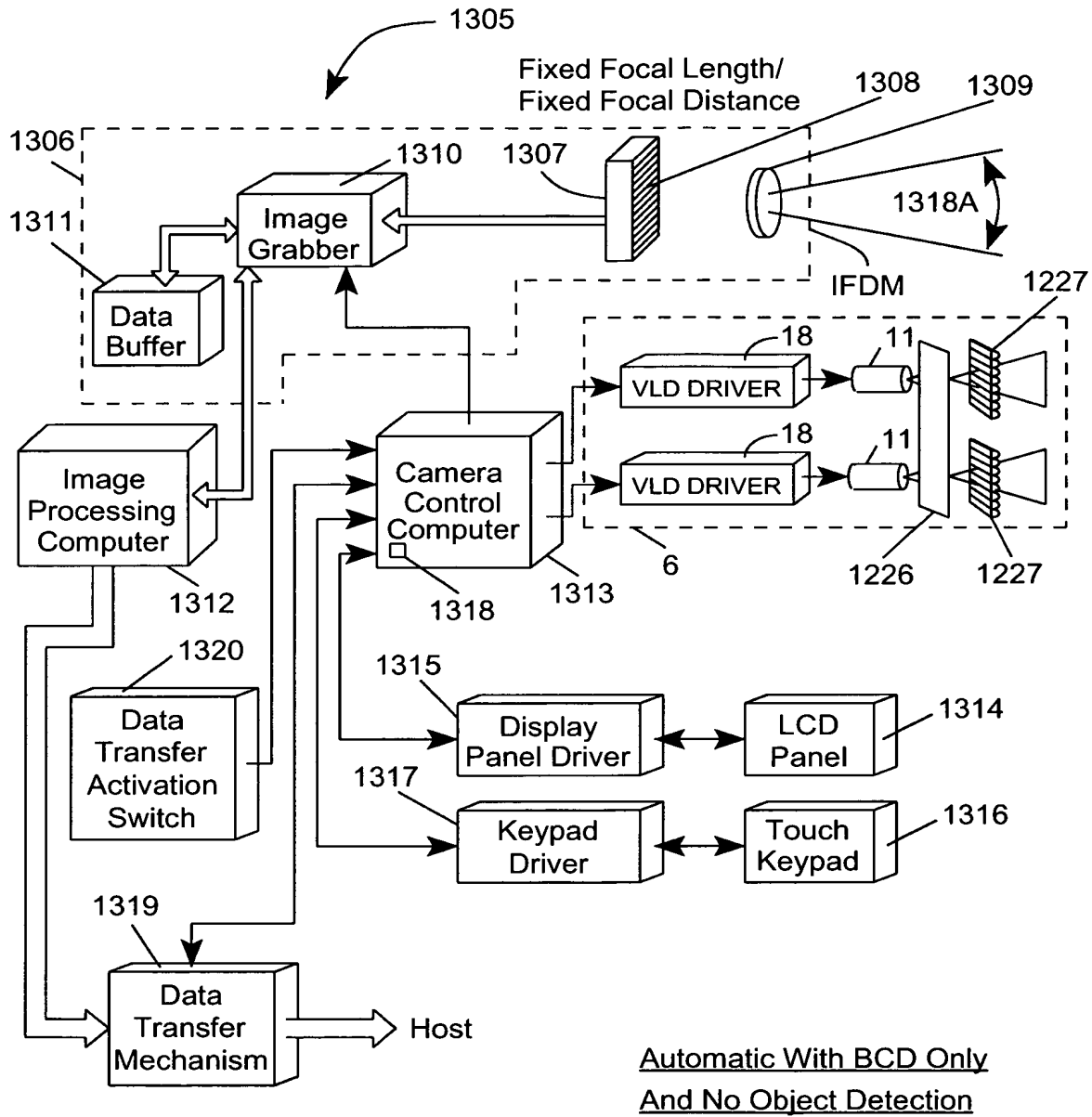
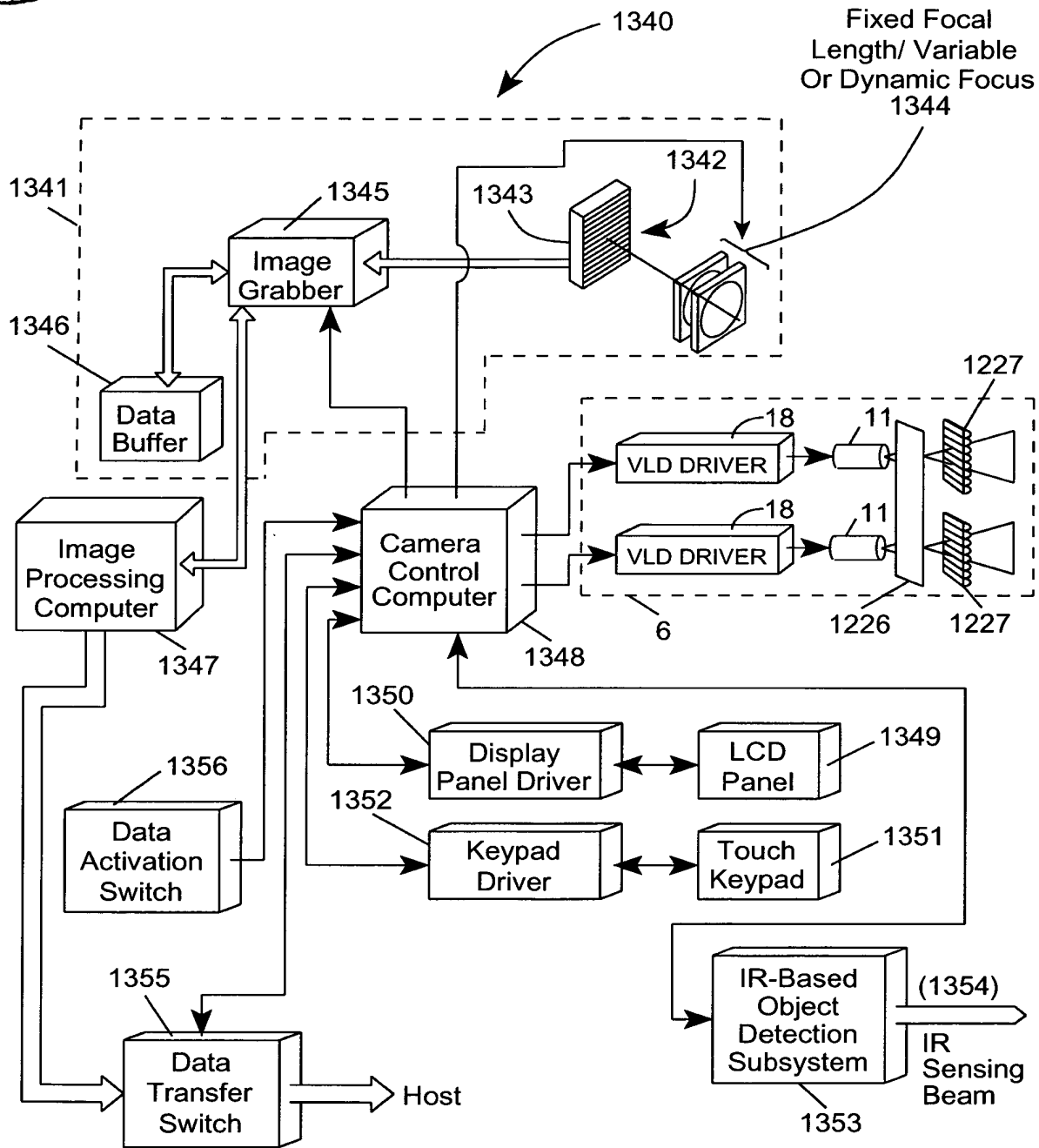


FIG. 40A5



Automatic With IR-Based
Object Detection

FIG. 40B2

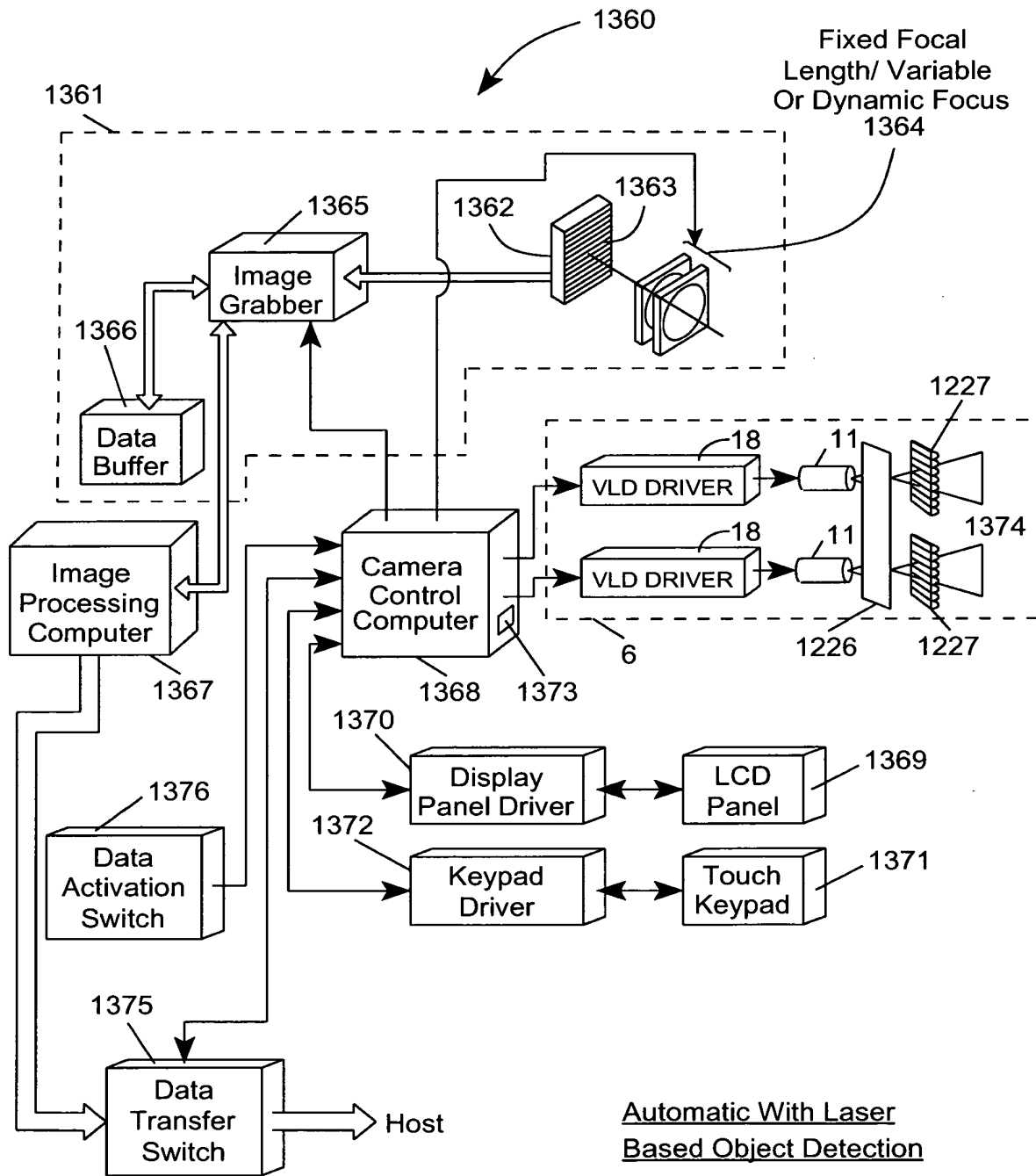


FIG. 40B3

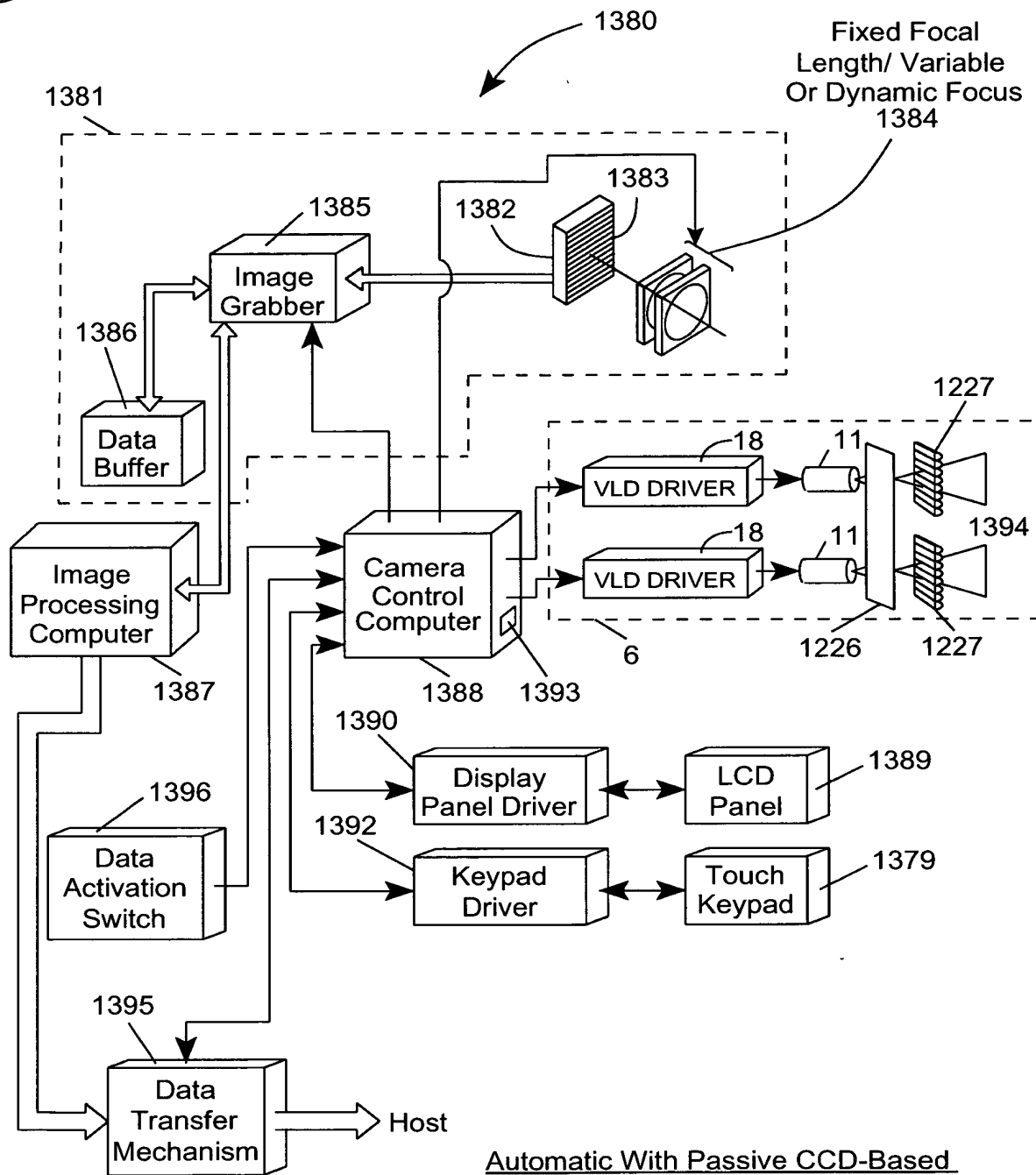


FIG. 40B4

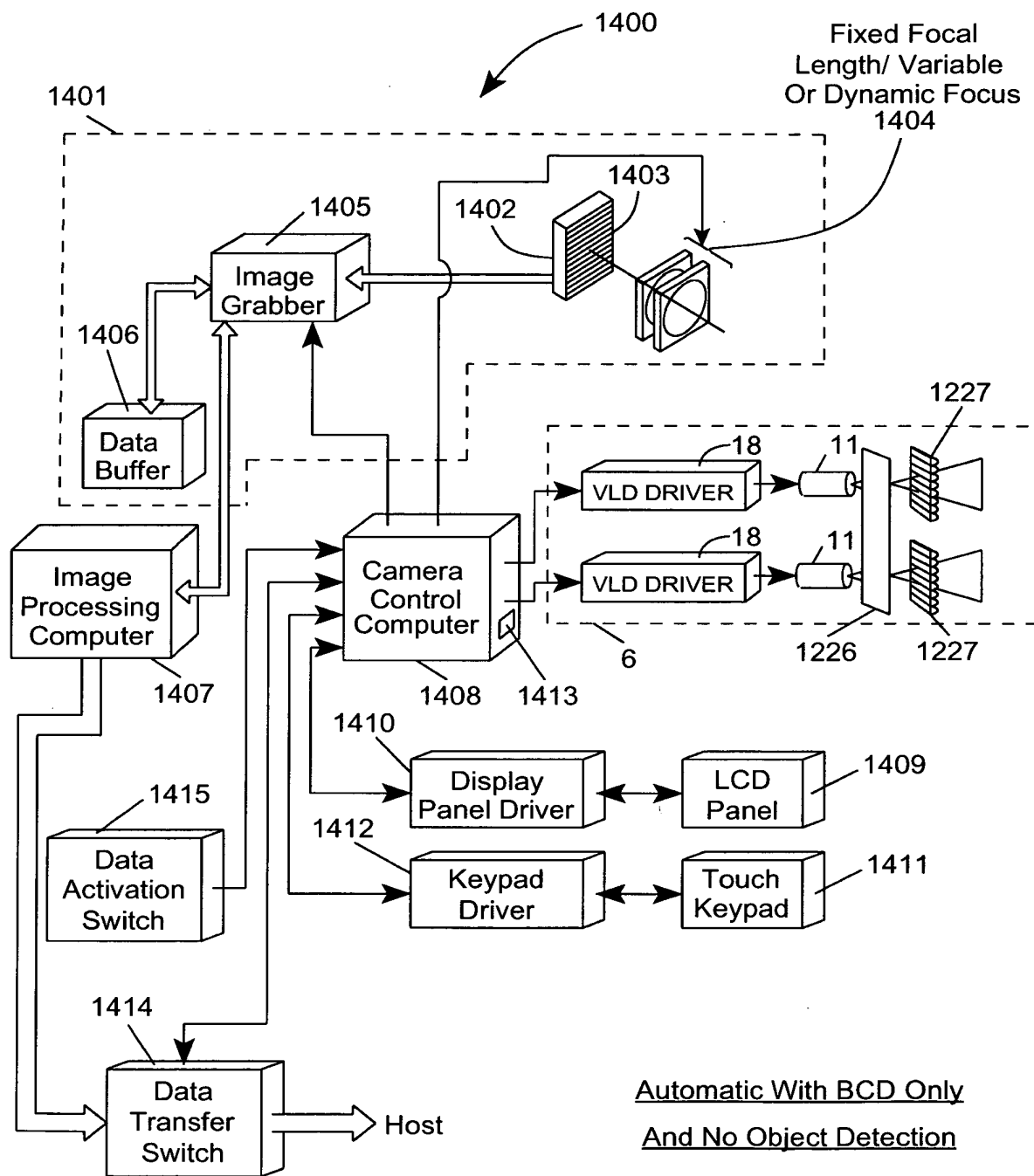
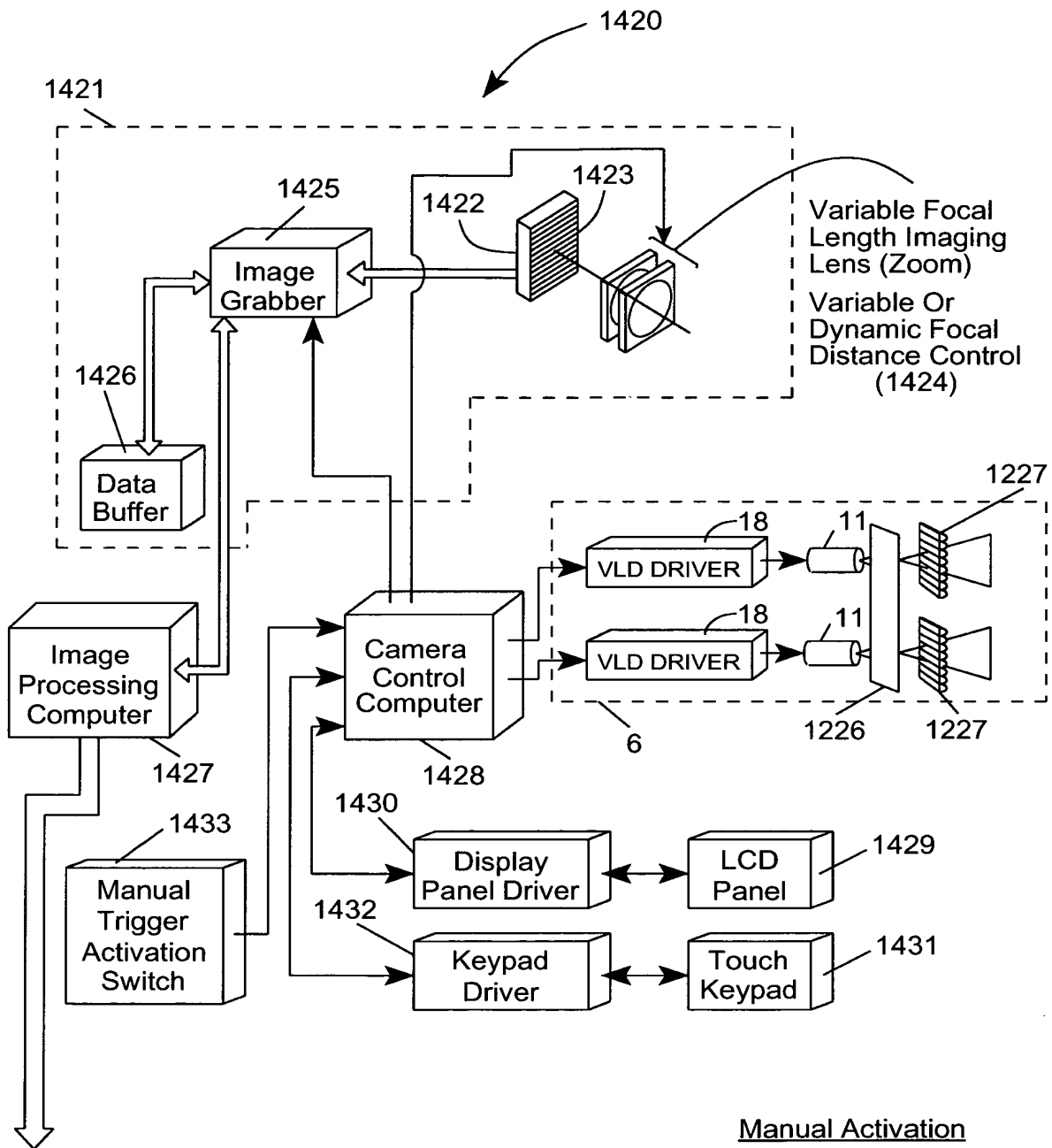


FIG. 40B5



Manual Activation

FIG. 40C1

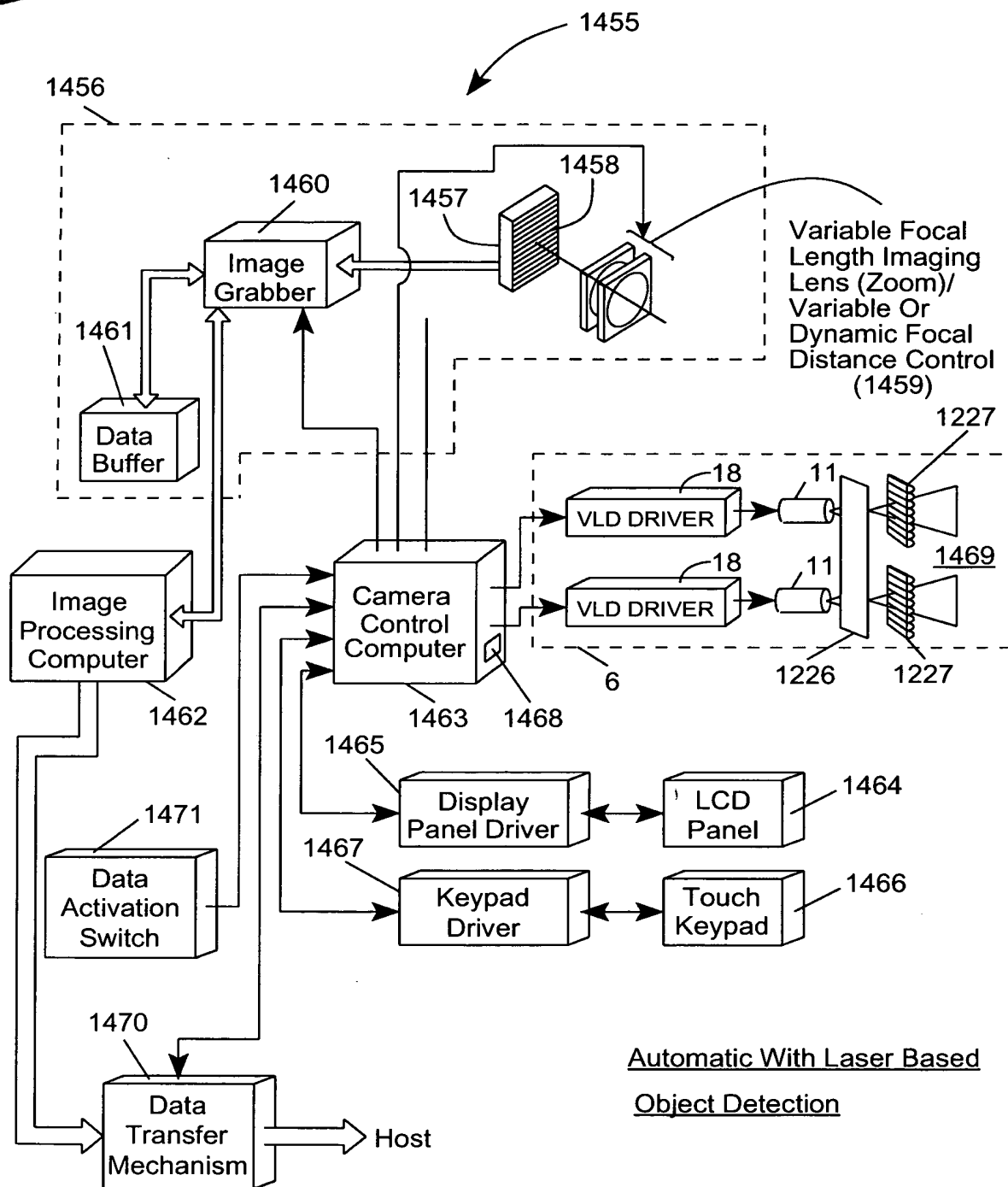


FIG. 40C3

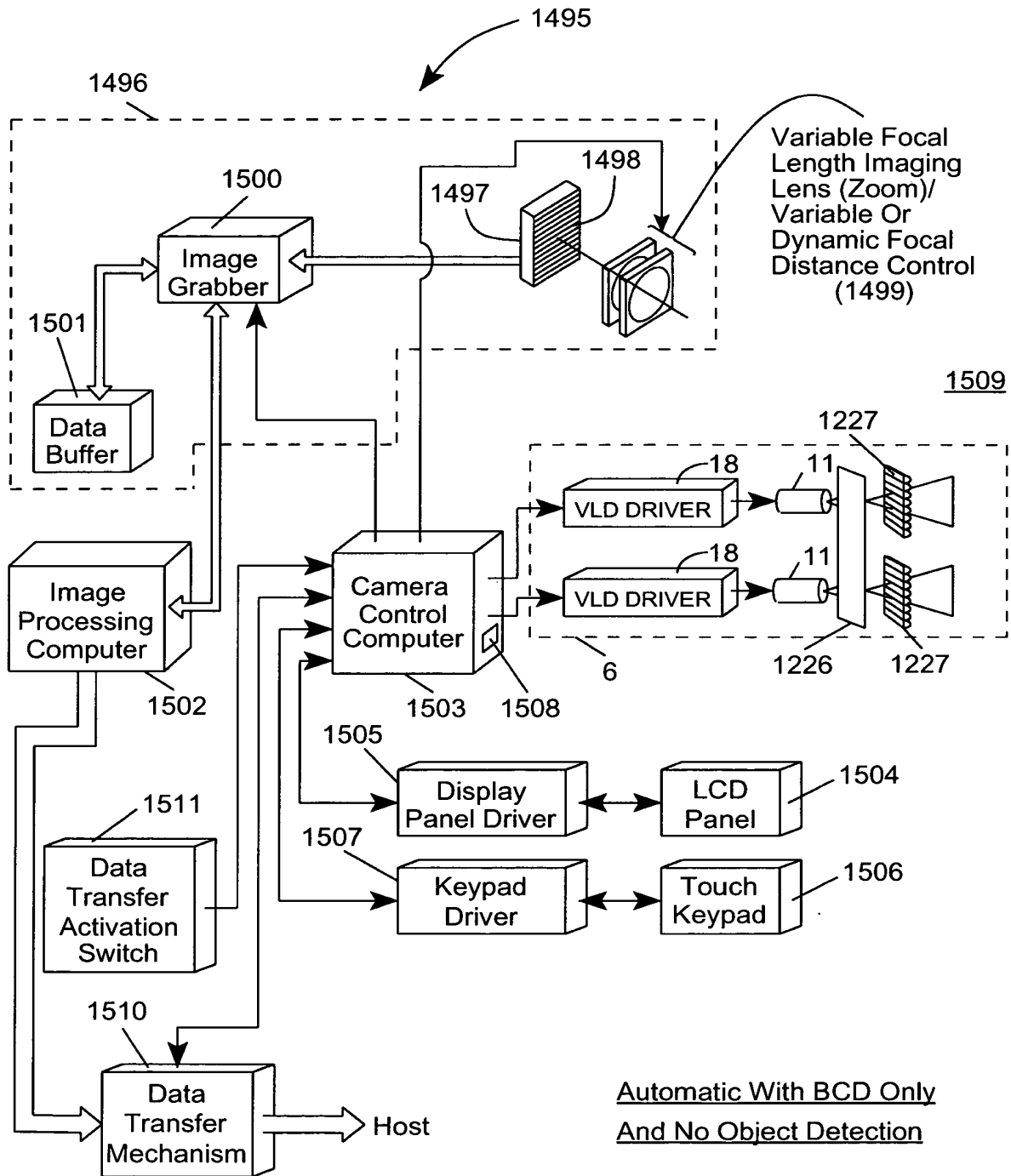


FIG. 40C5

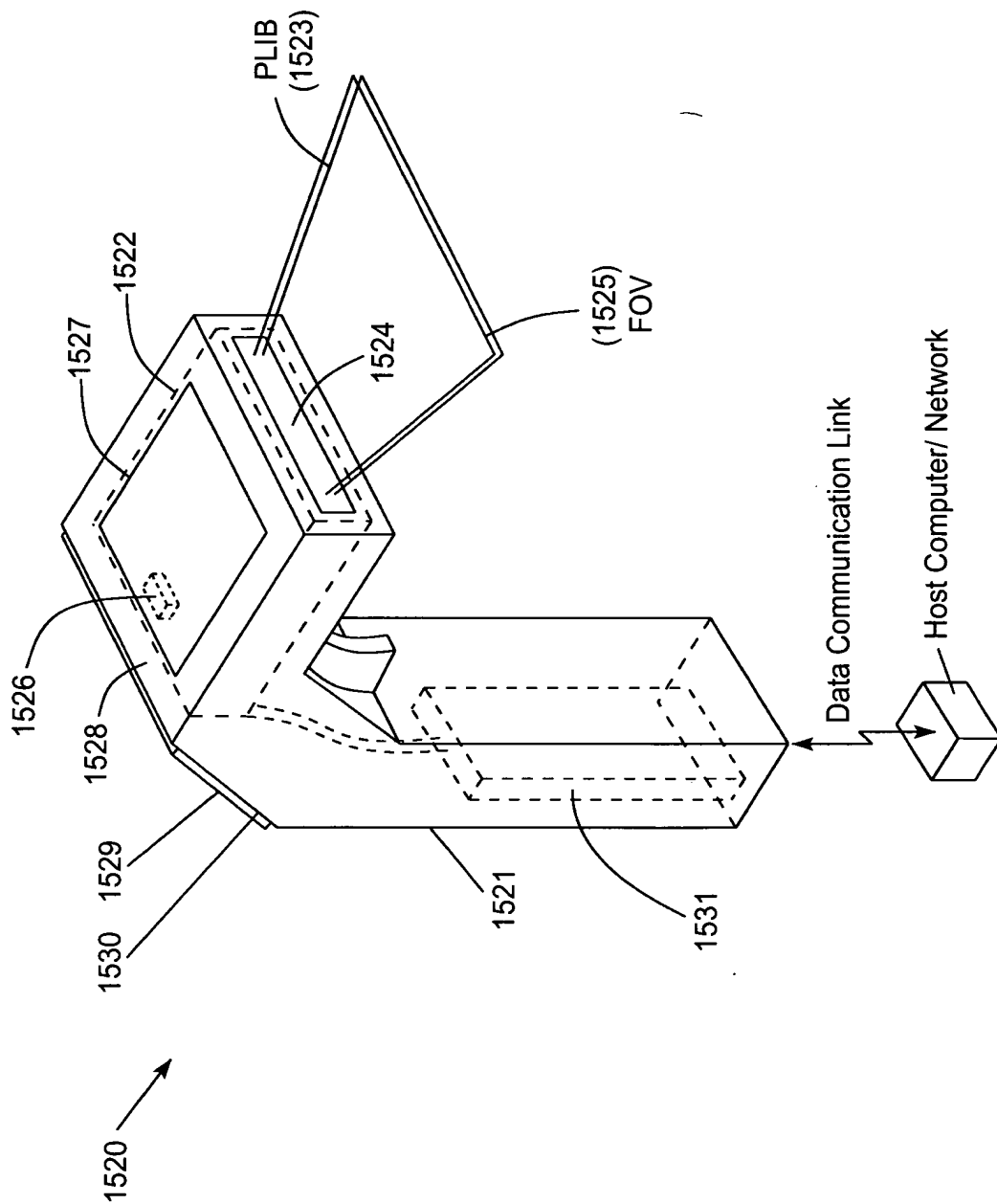


FIG. 41A

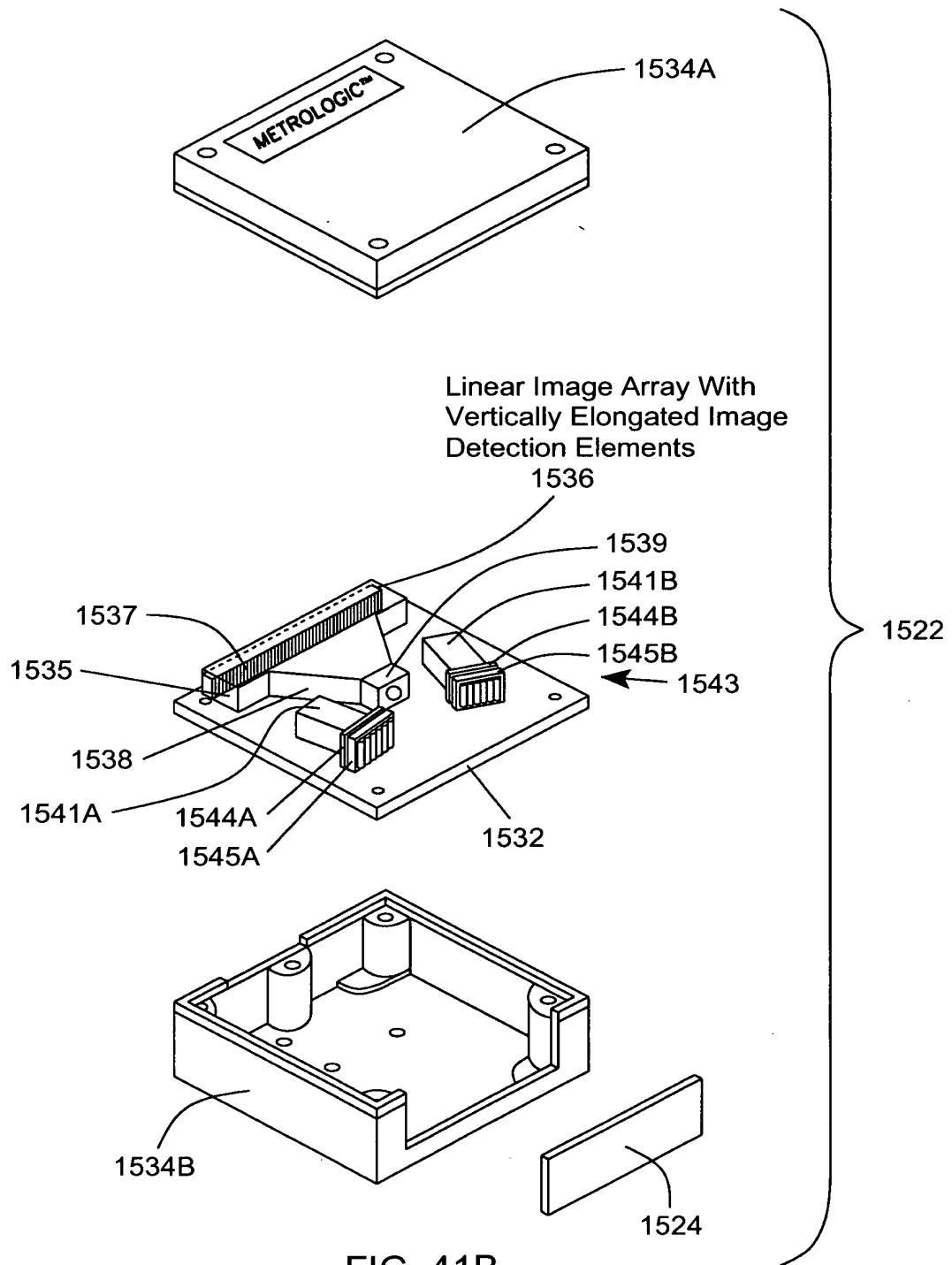


FIG. 41B

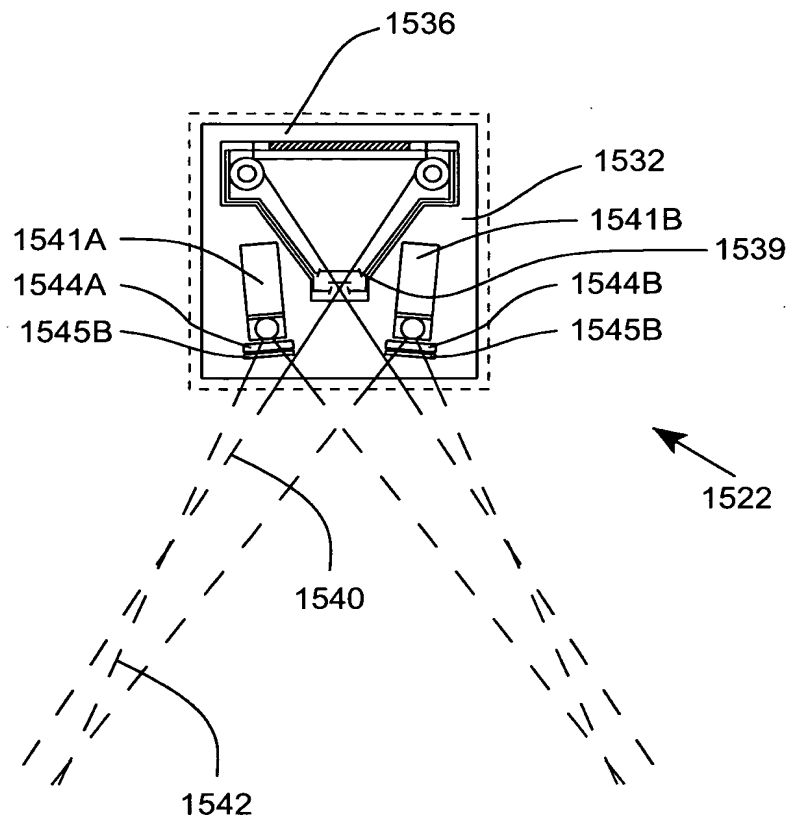


FIG. 41C

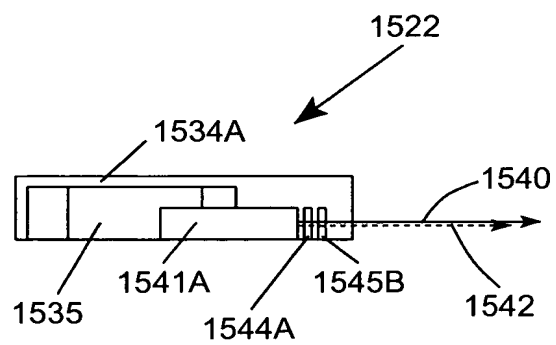


FIG. 41D

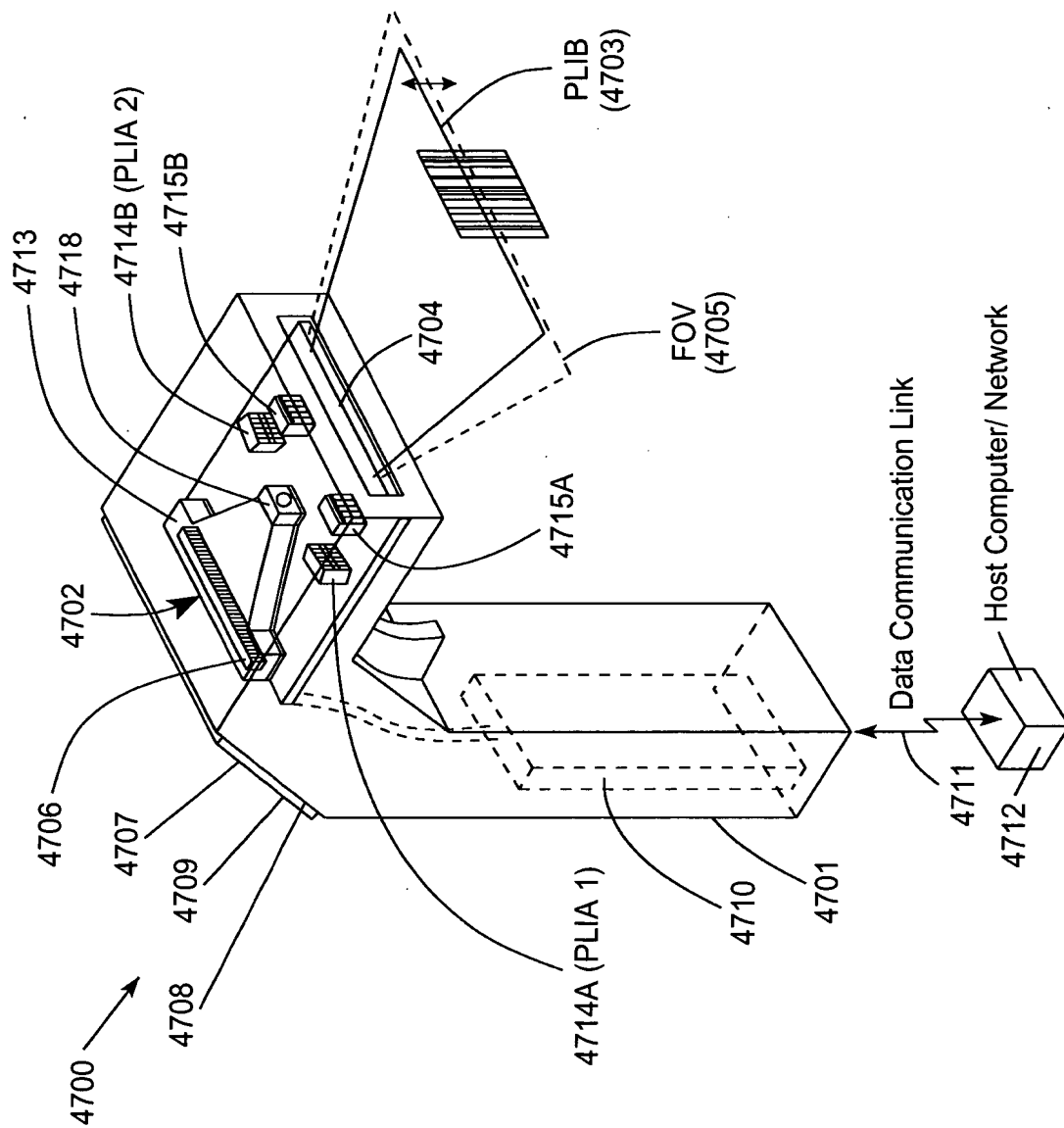


FIG. 42

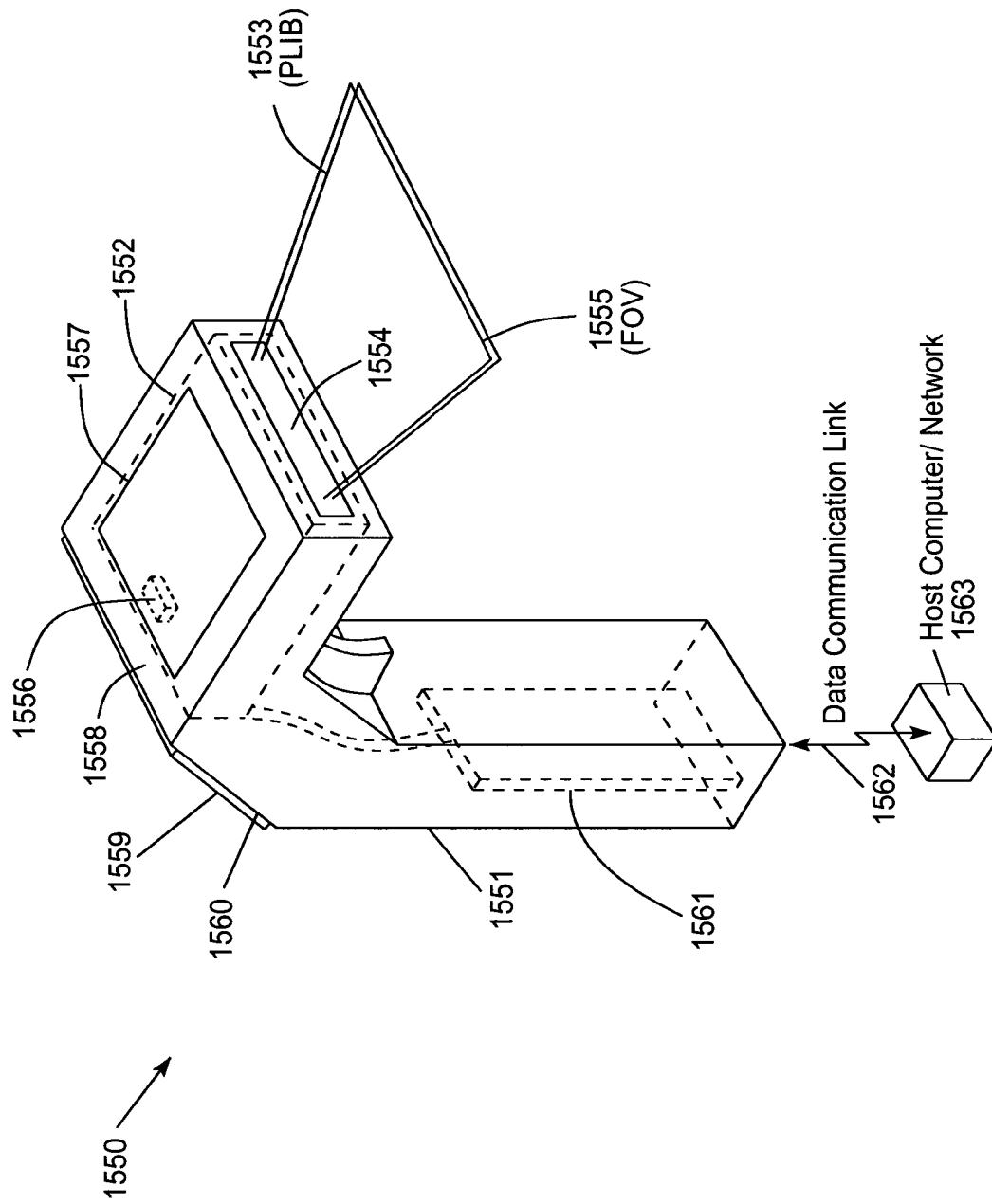


FIG. 42A

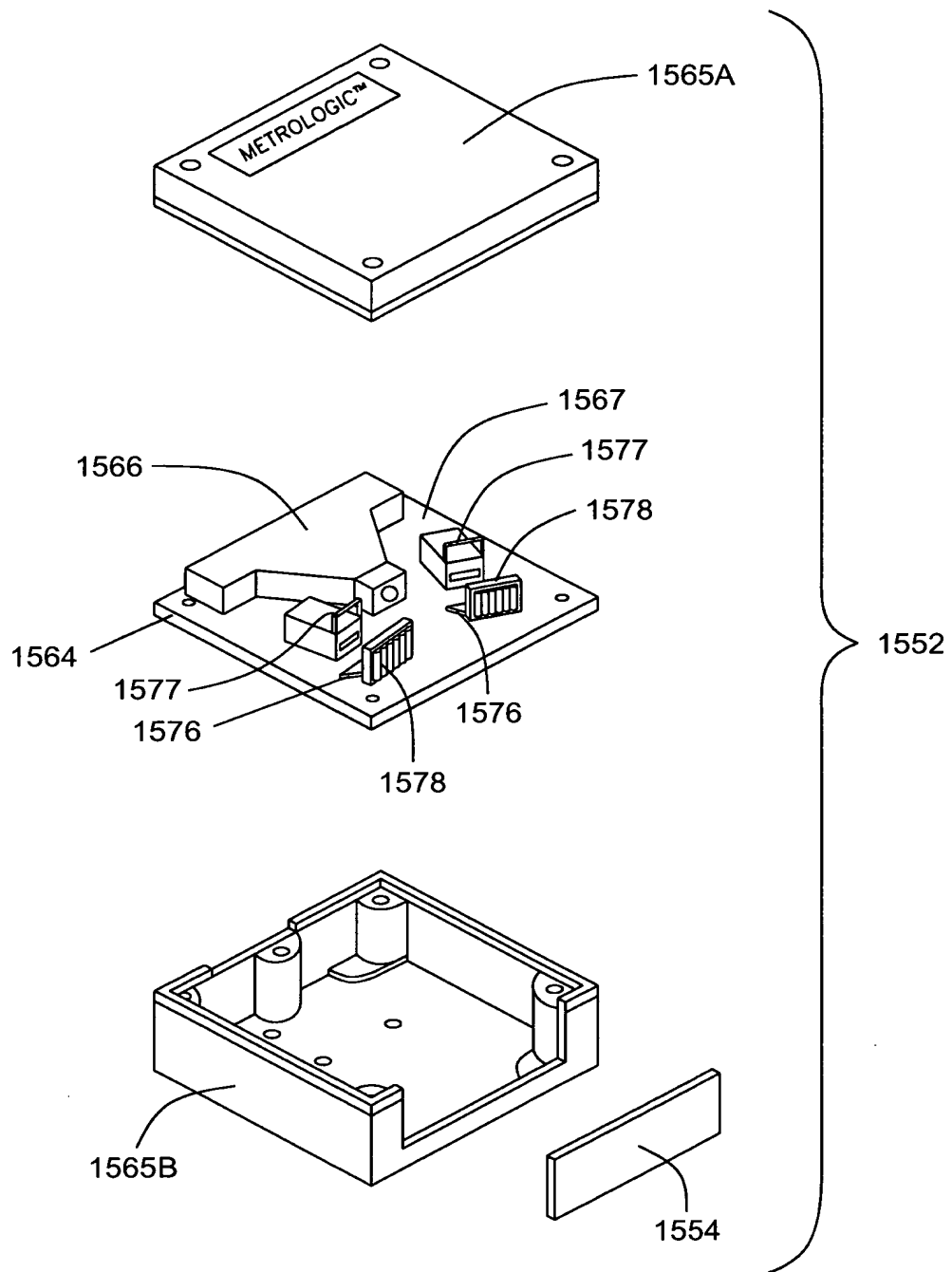


FIG. 42B

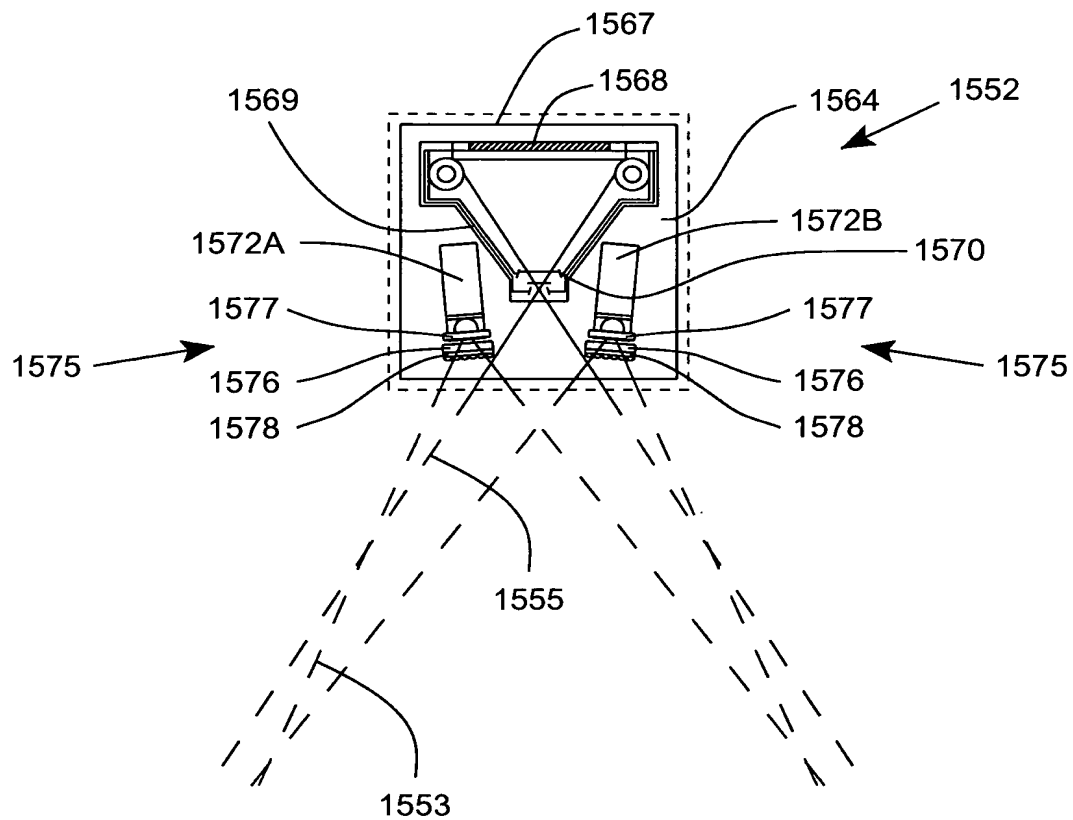


FIG. 42C

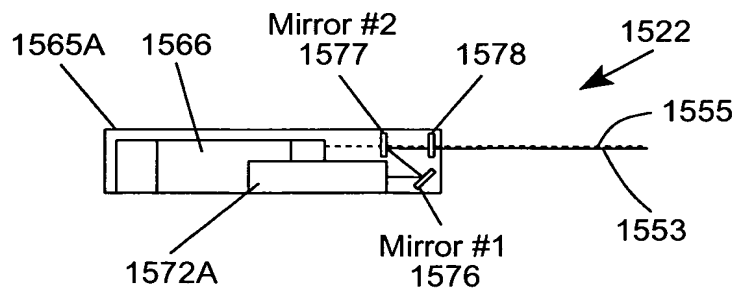


FIG. 42D

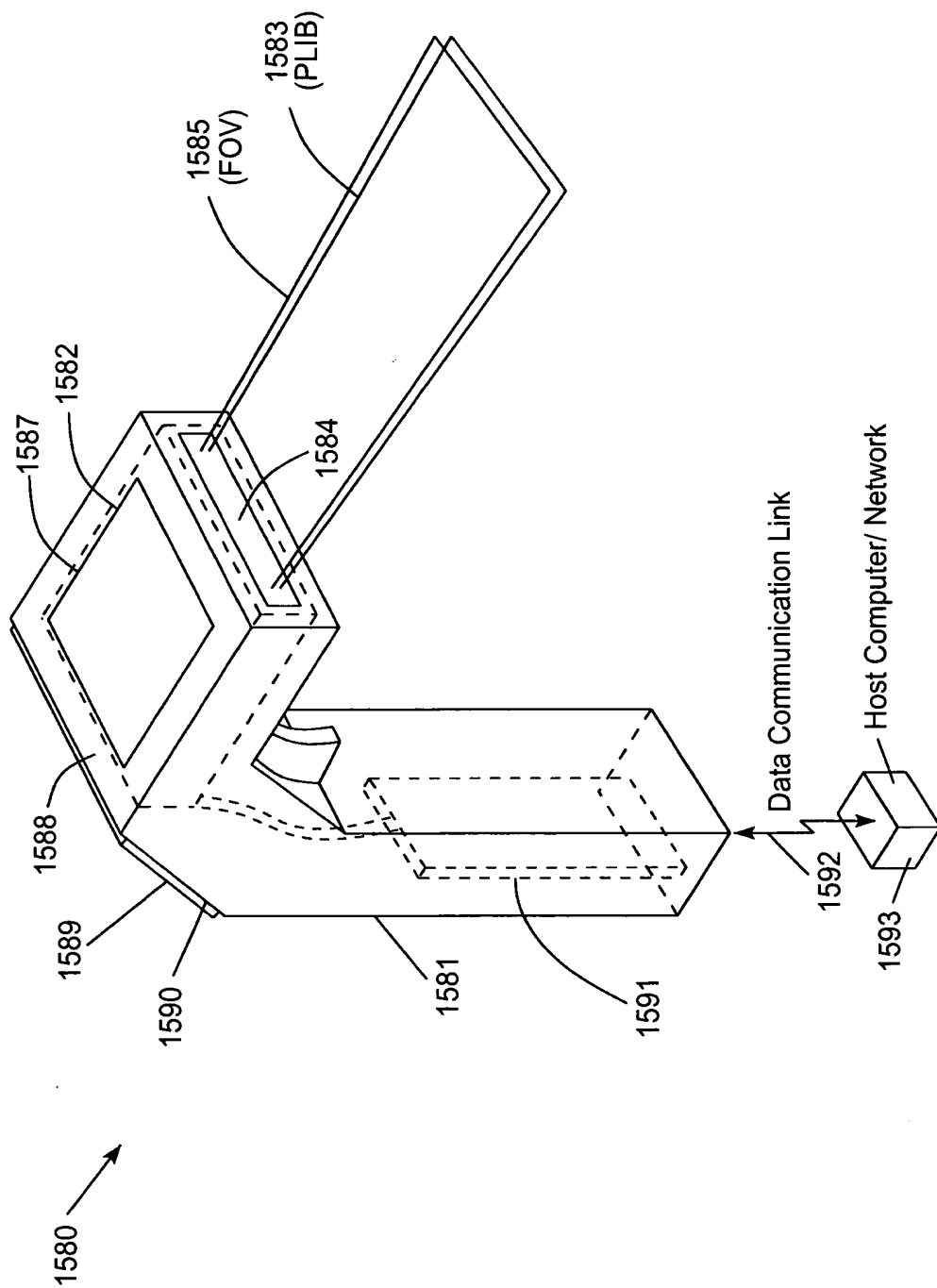


FIG. 43A

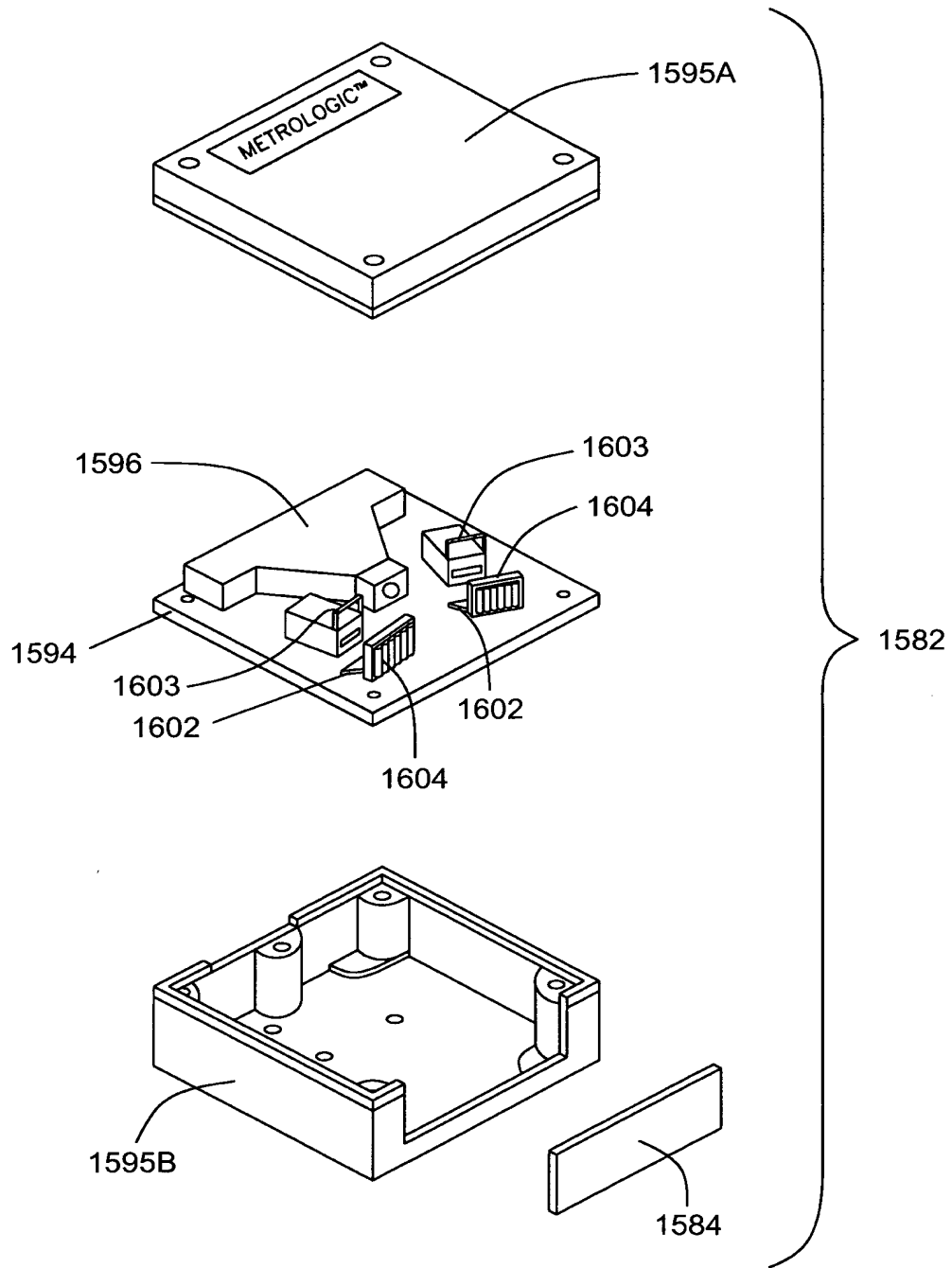


FIG. 43B

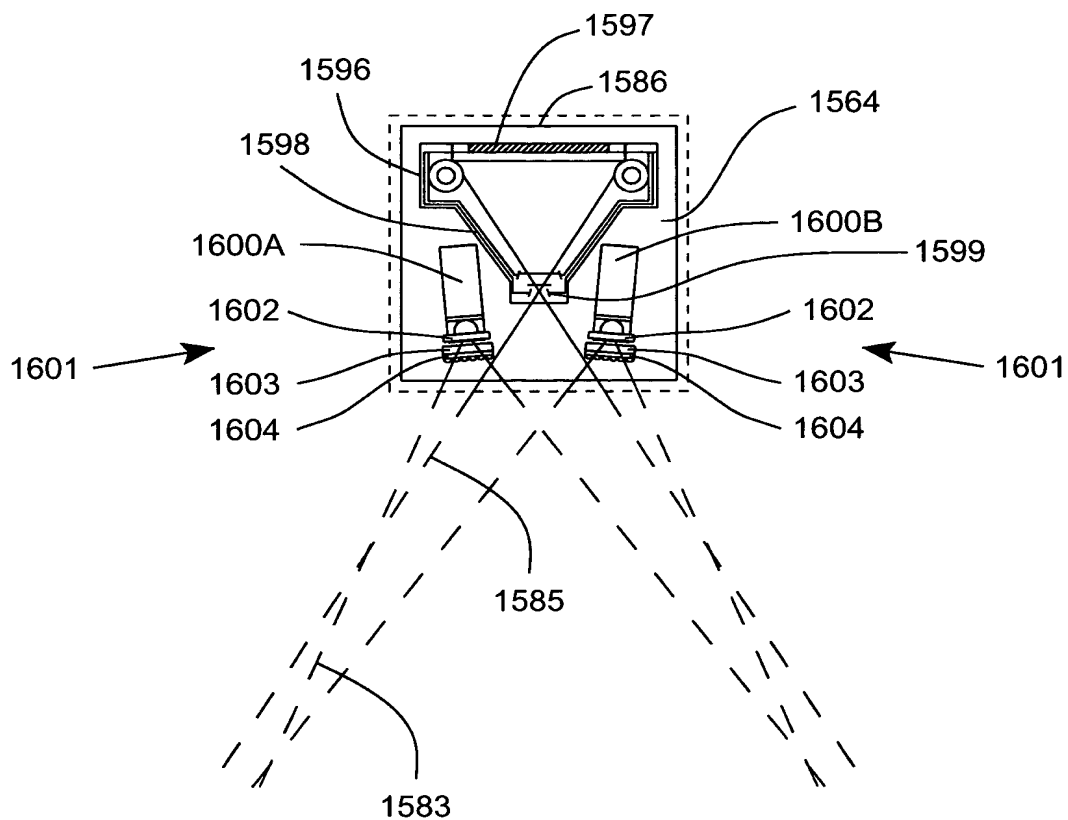


FIG. 43C

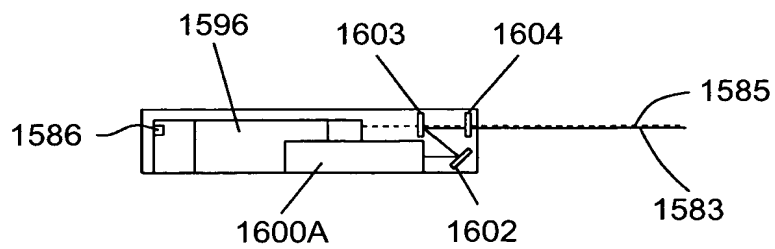


FIG. 43D

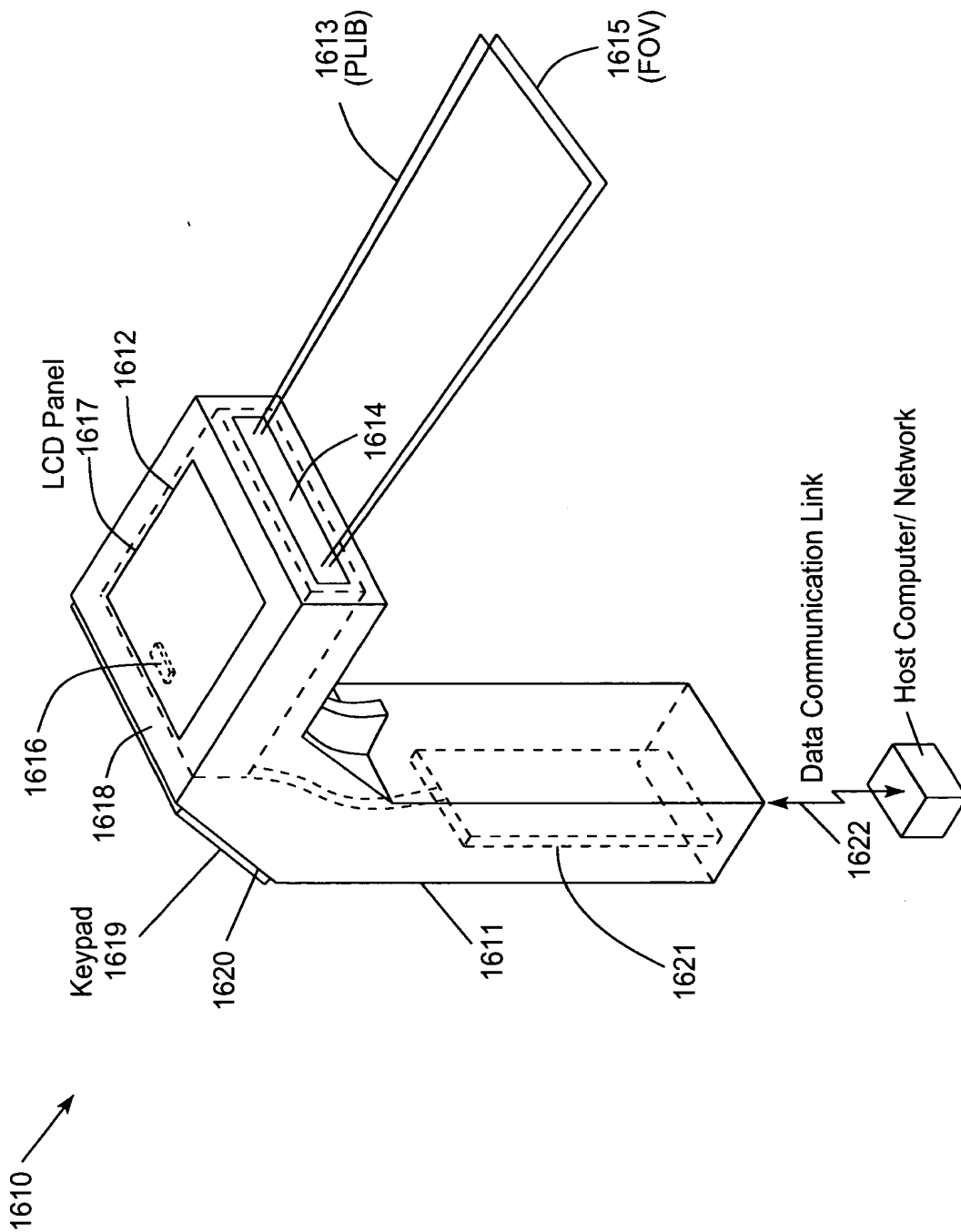


FIG. 44A

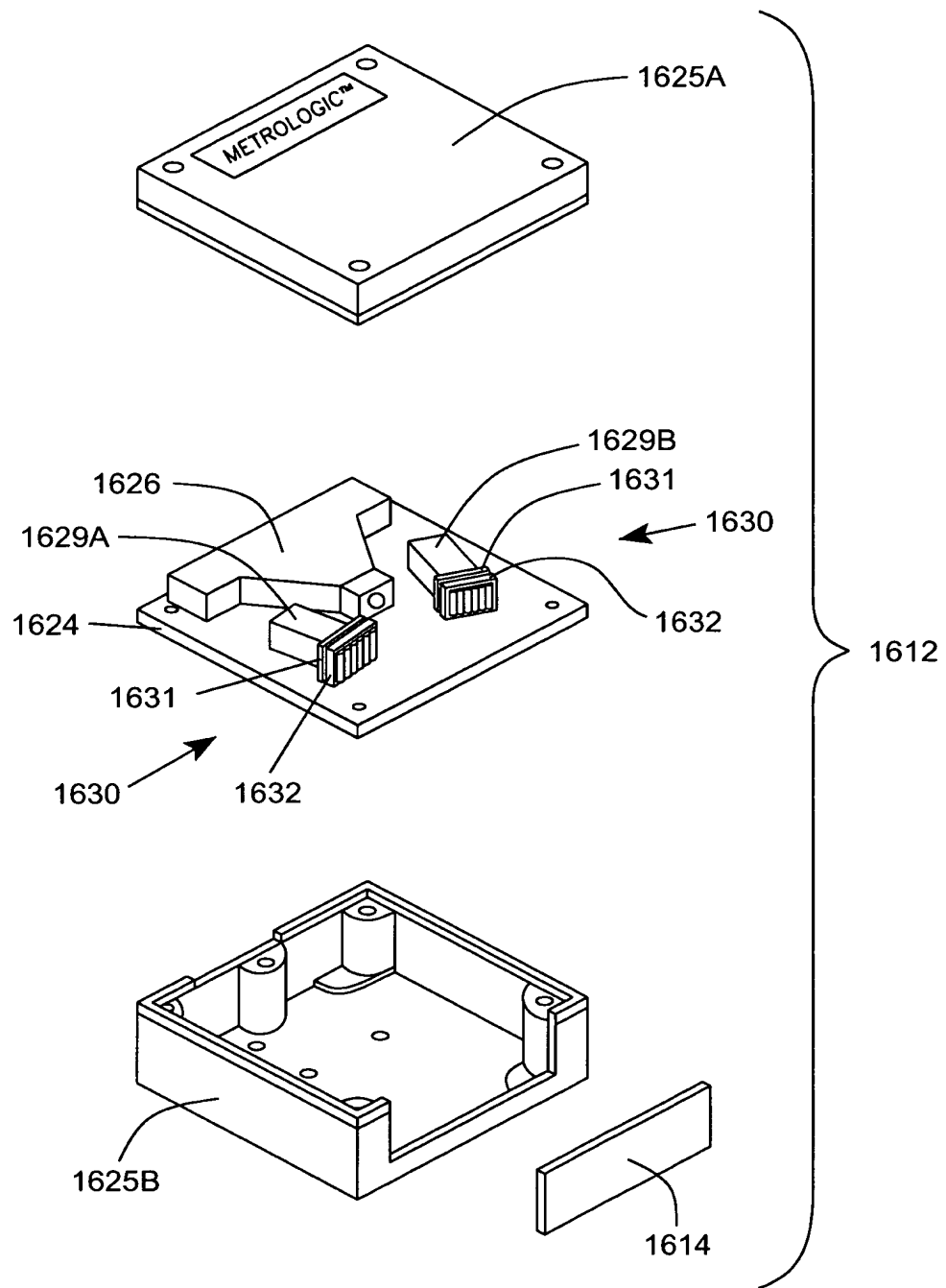


FIG. 44B

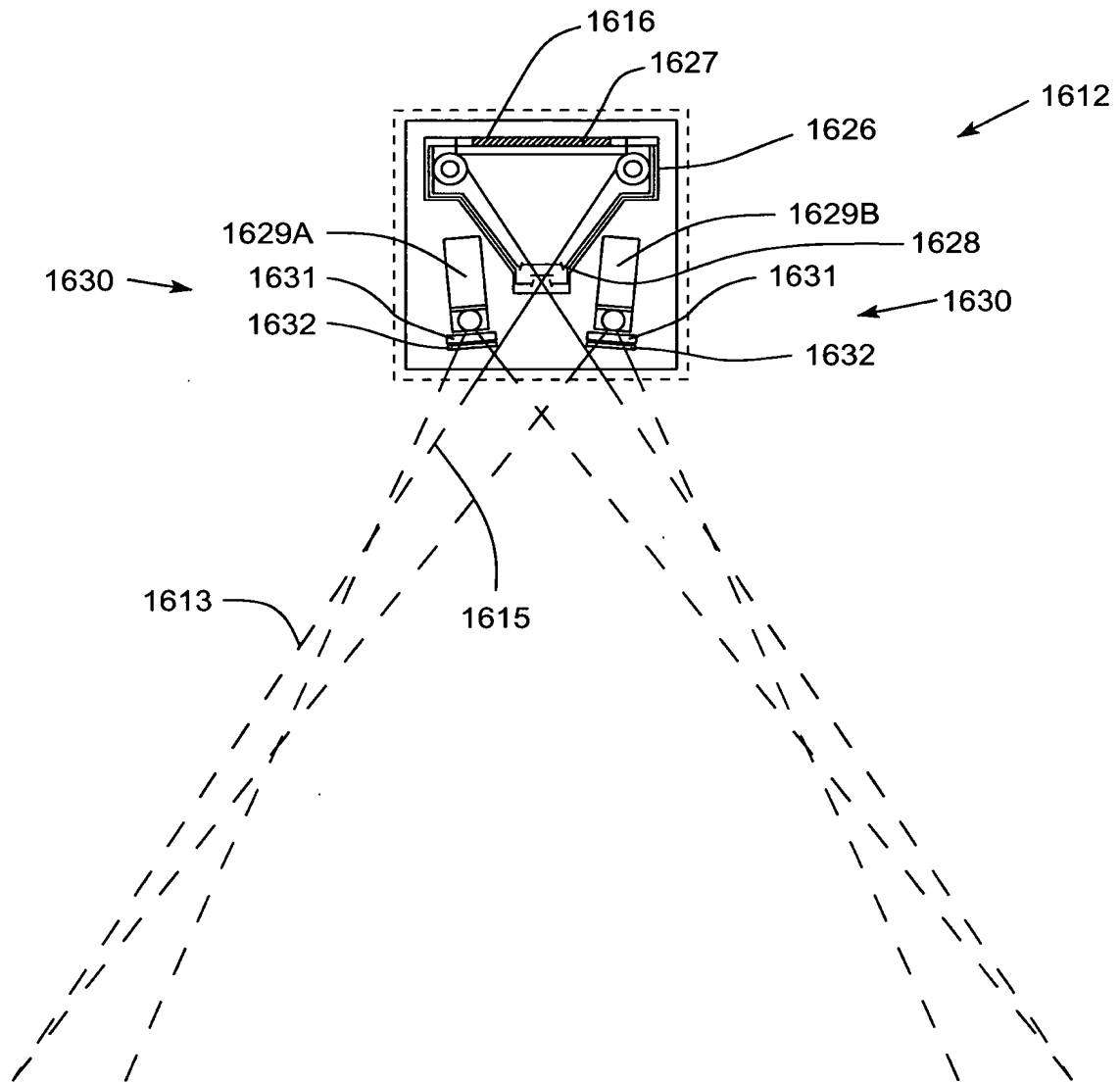


FIG. 44C

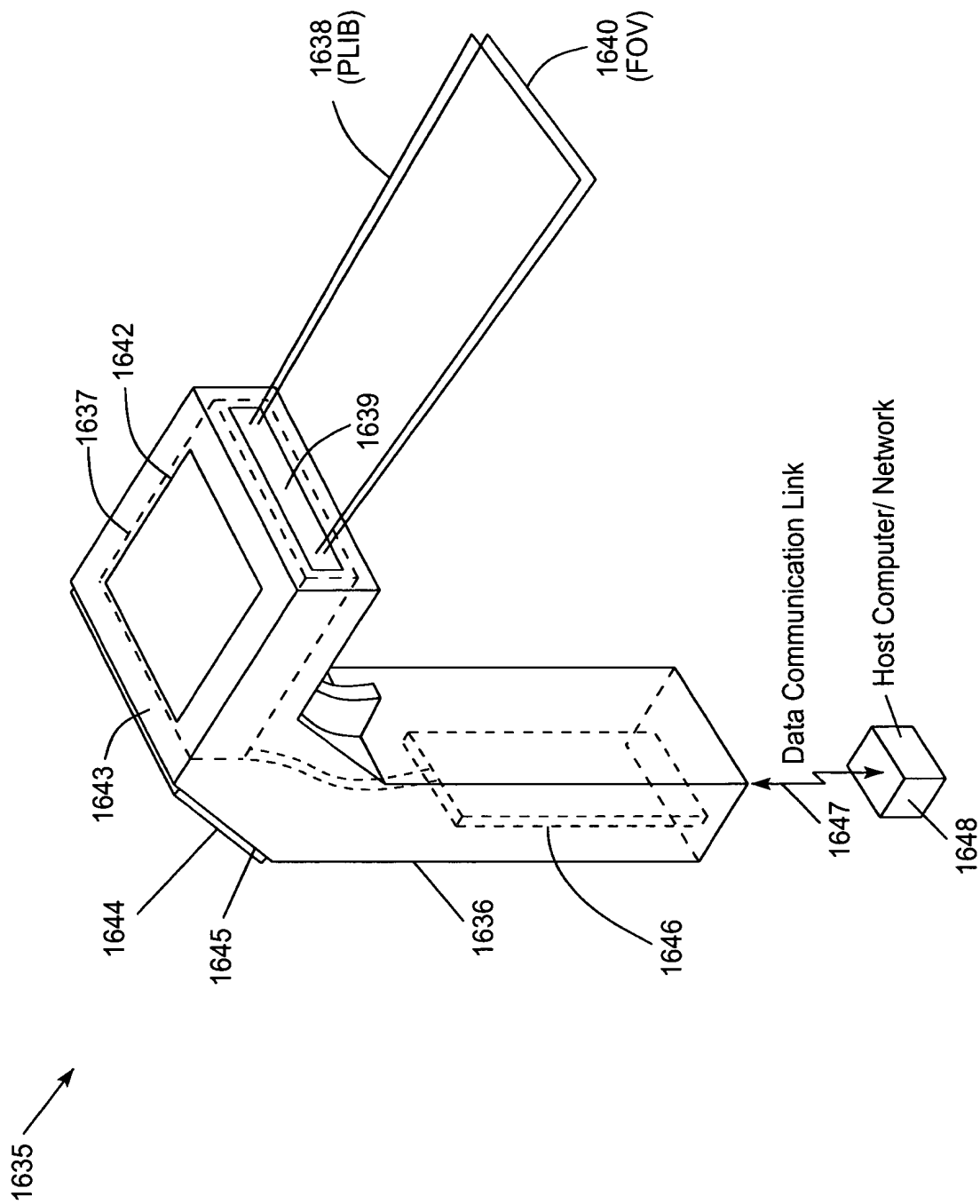


FIG. 45A

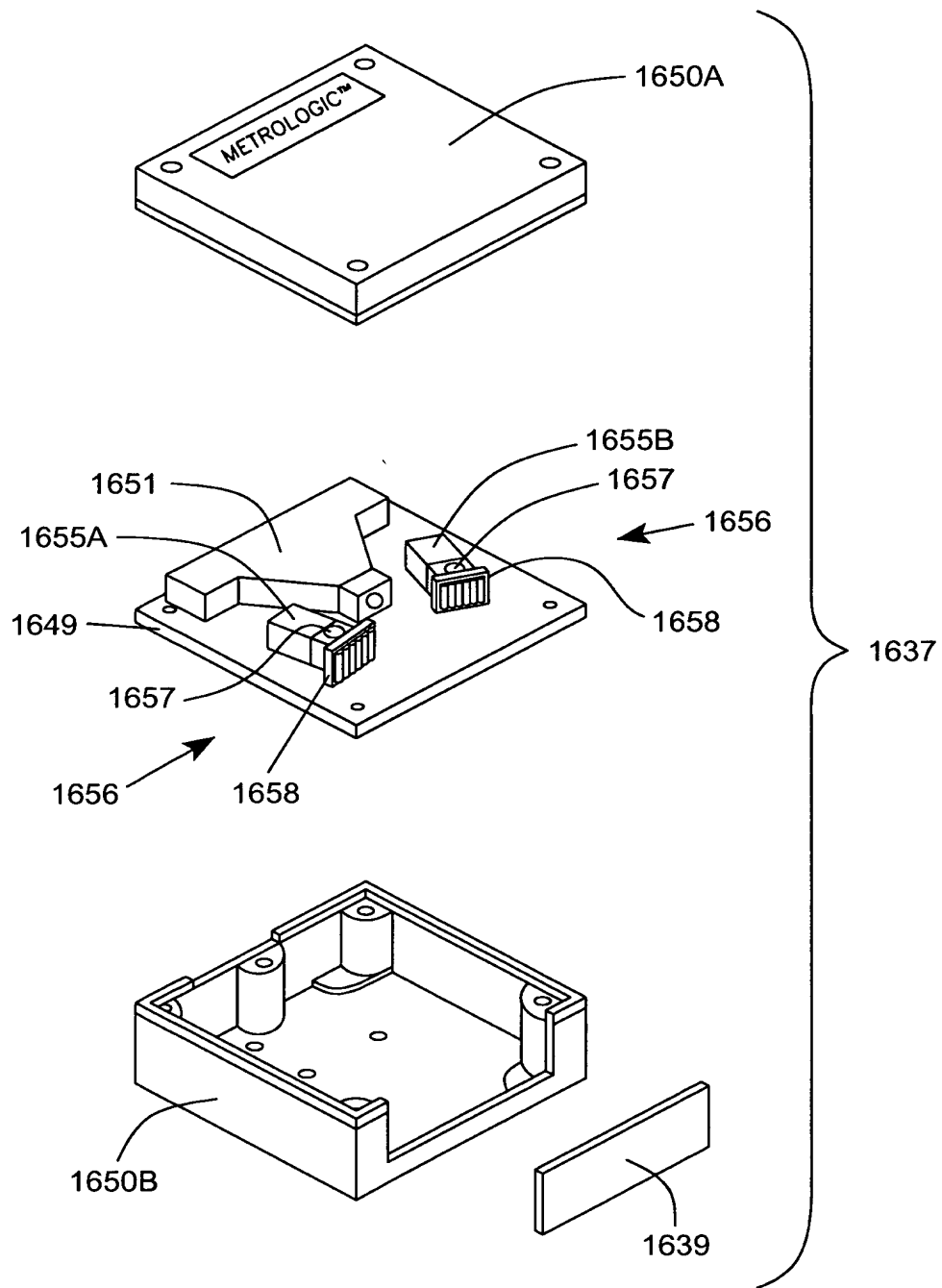


FIG. 45B

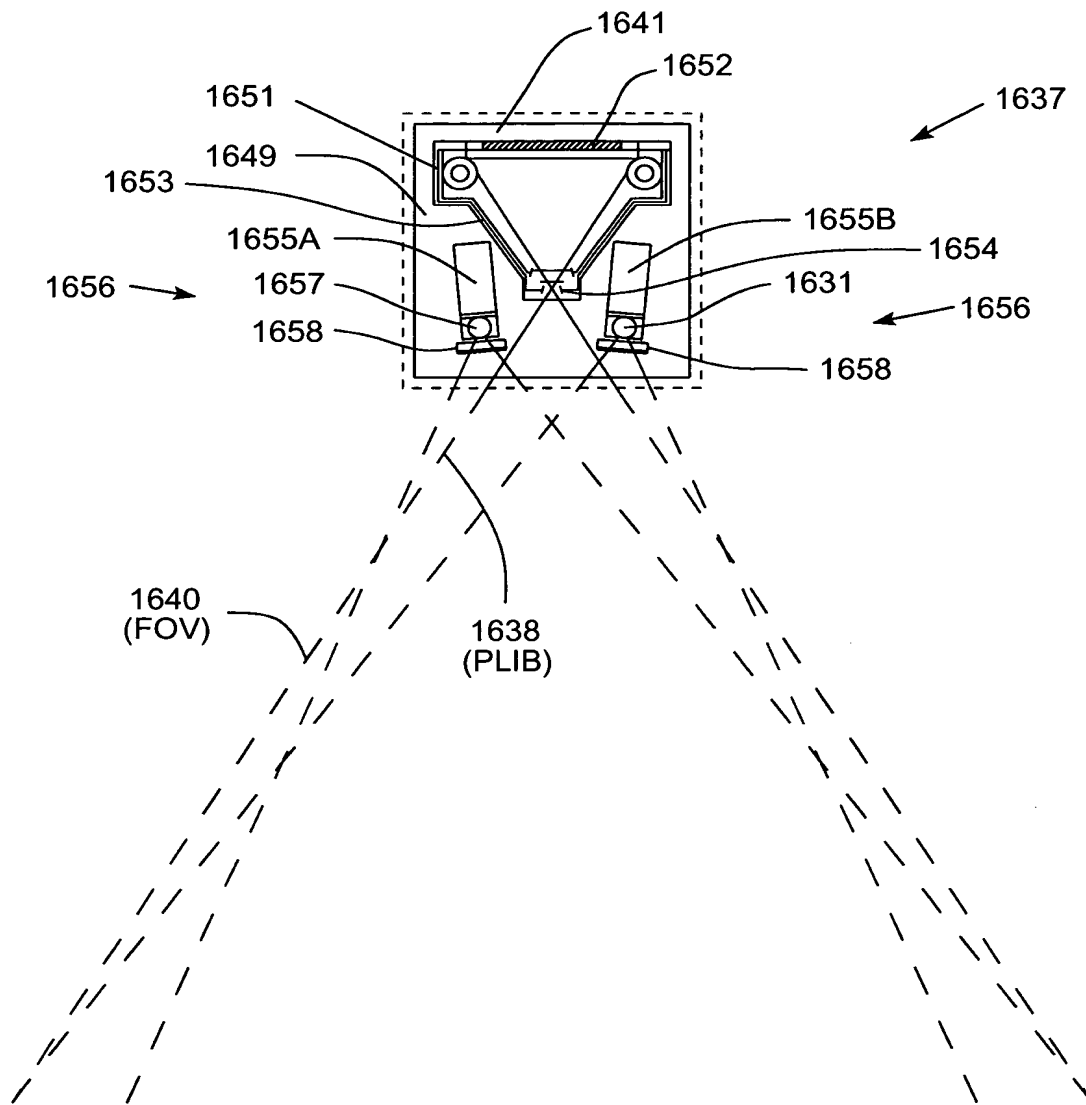


FIG. 45C

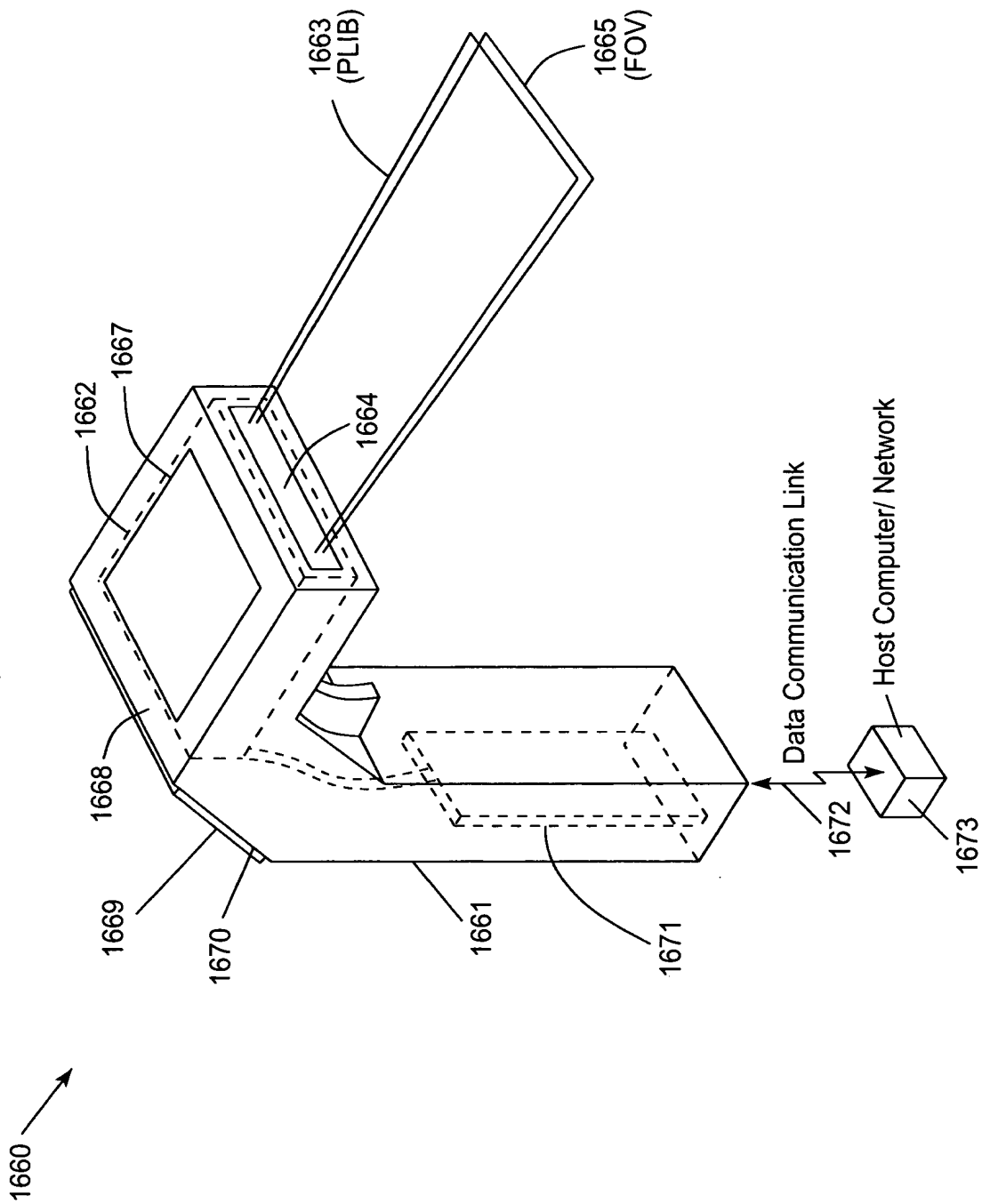


FIG. 46A

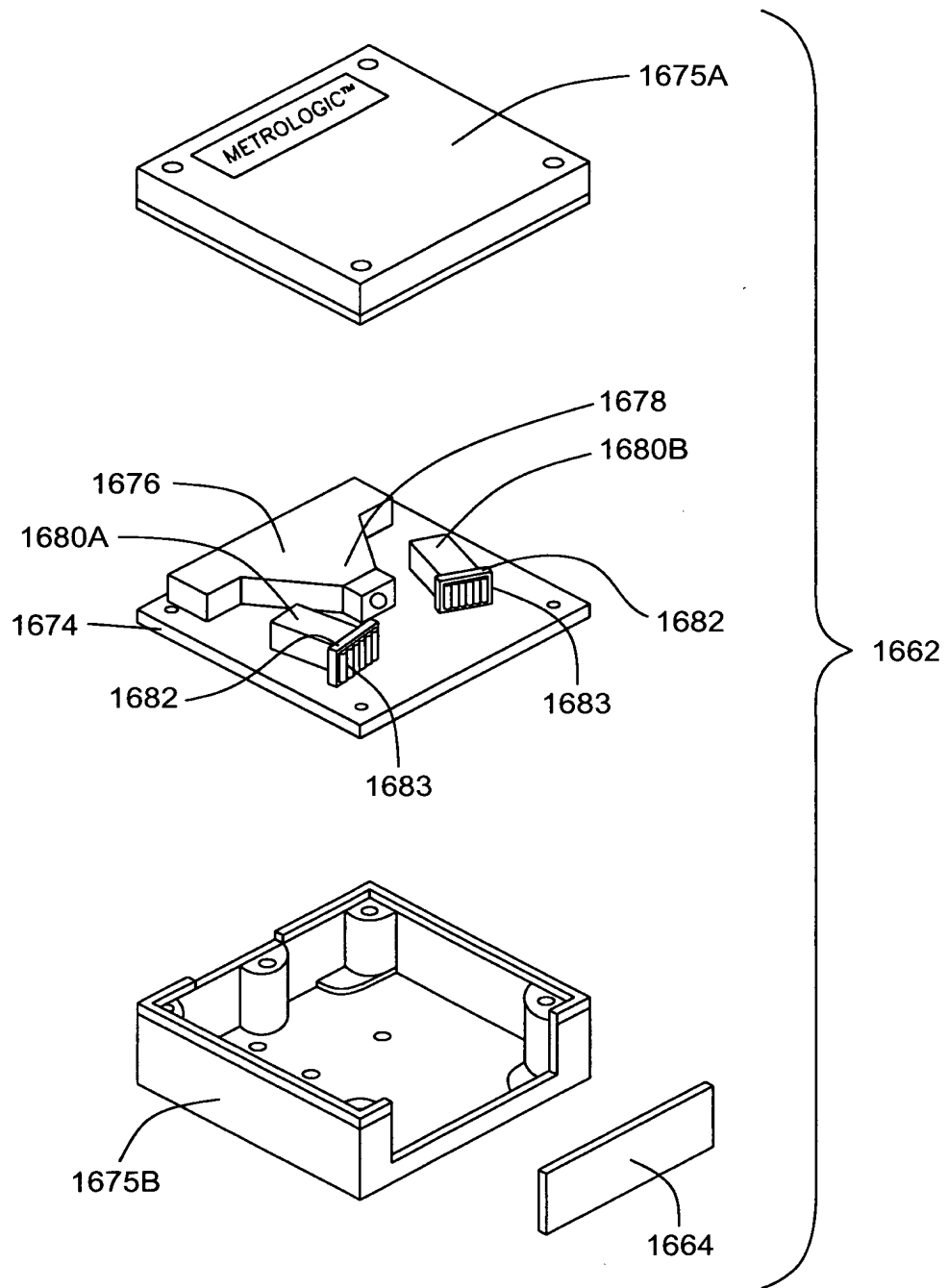


FIG. 46B

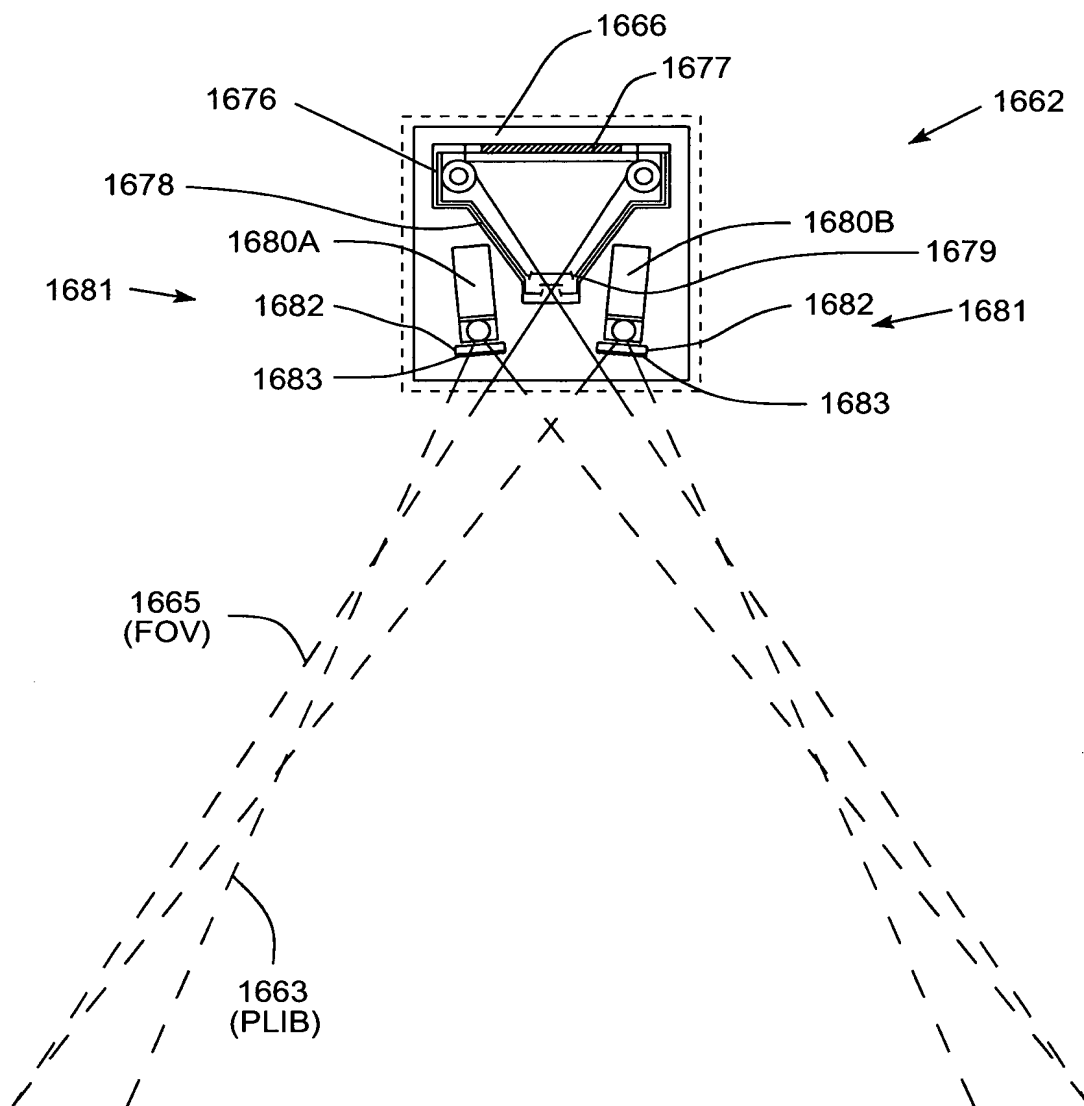


FIG. 46C

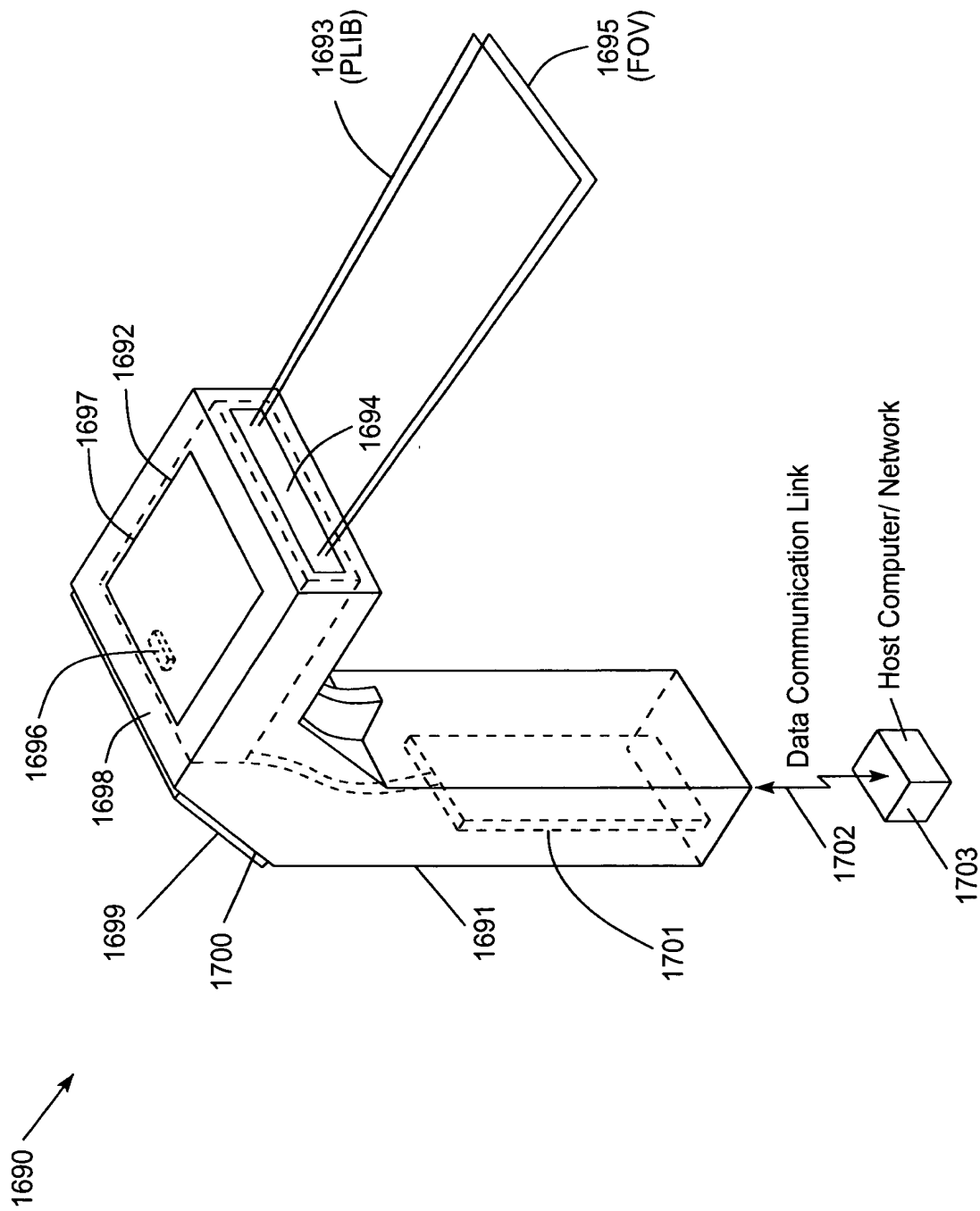


FIG. 47A

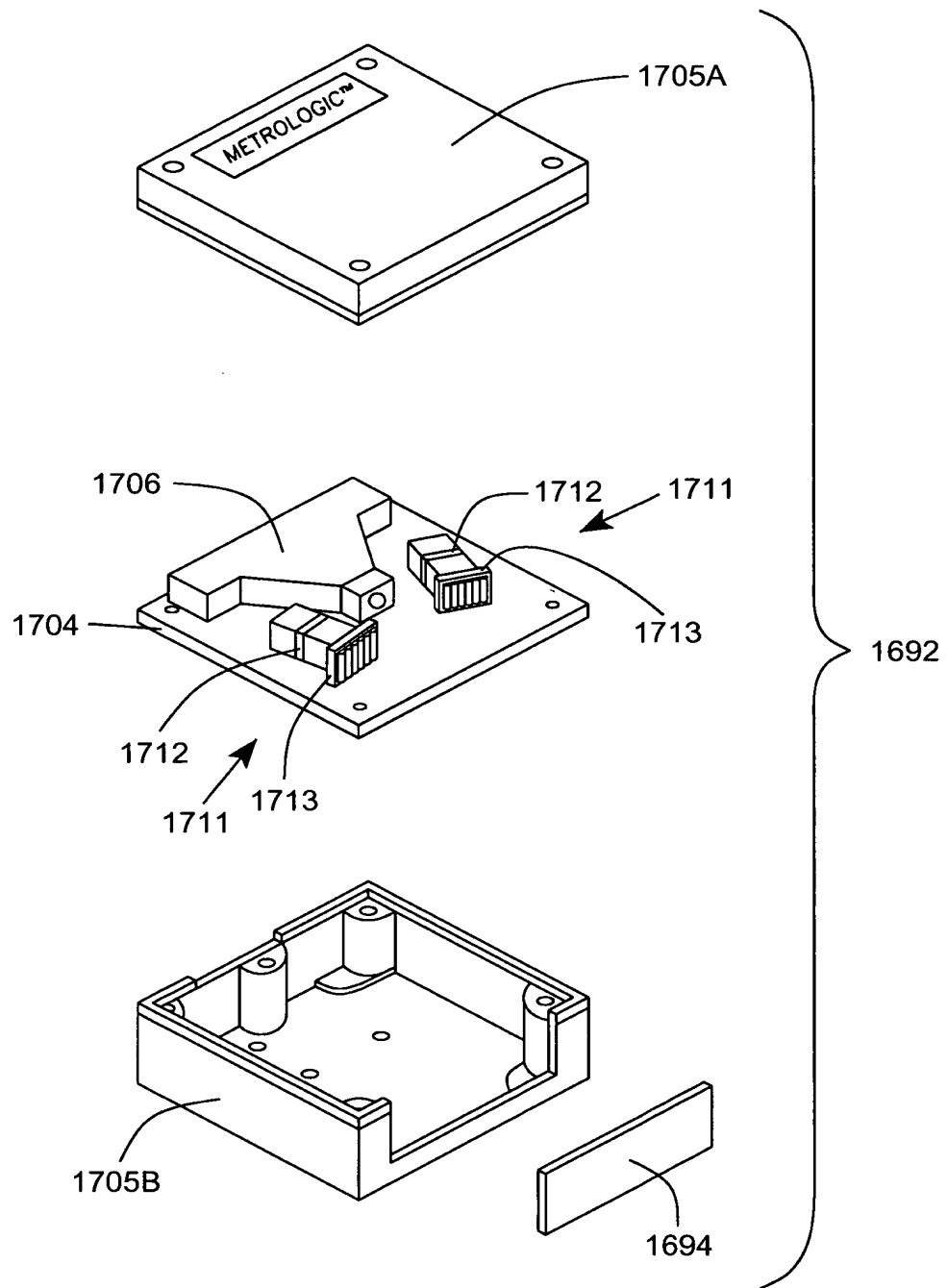


FIG. 47B

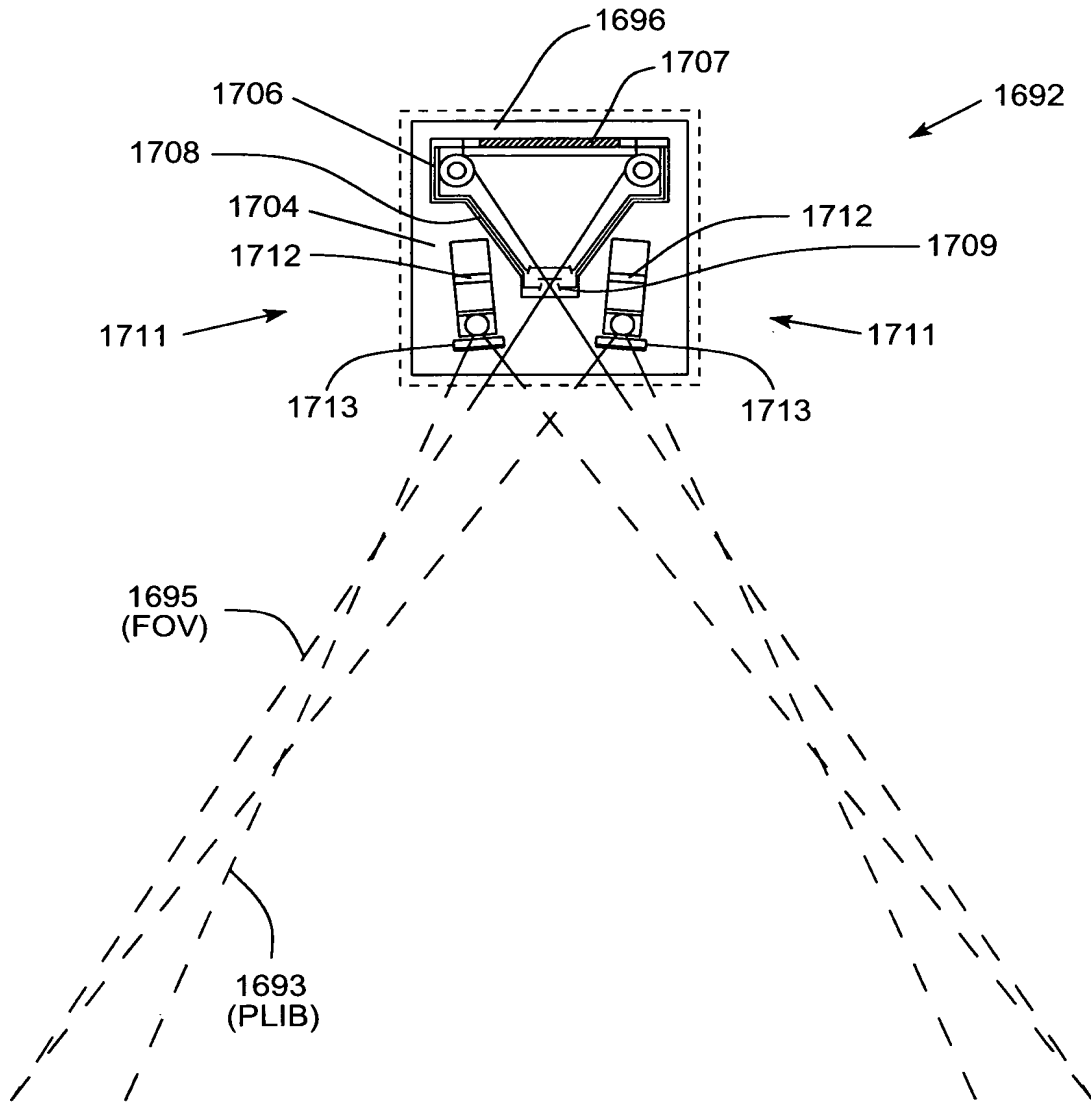


FIG. 47C

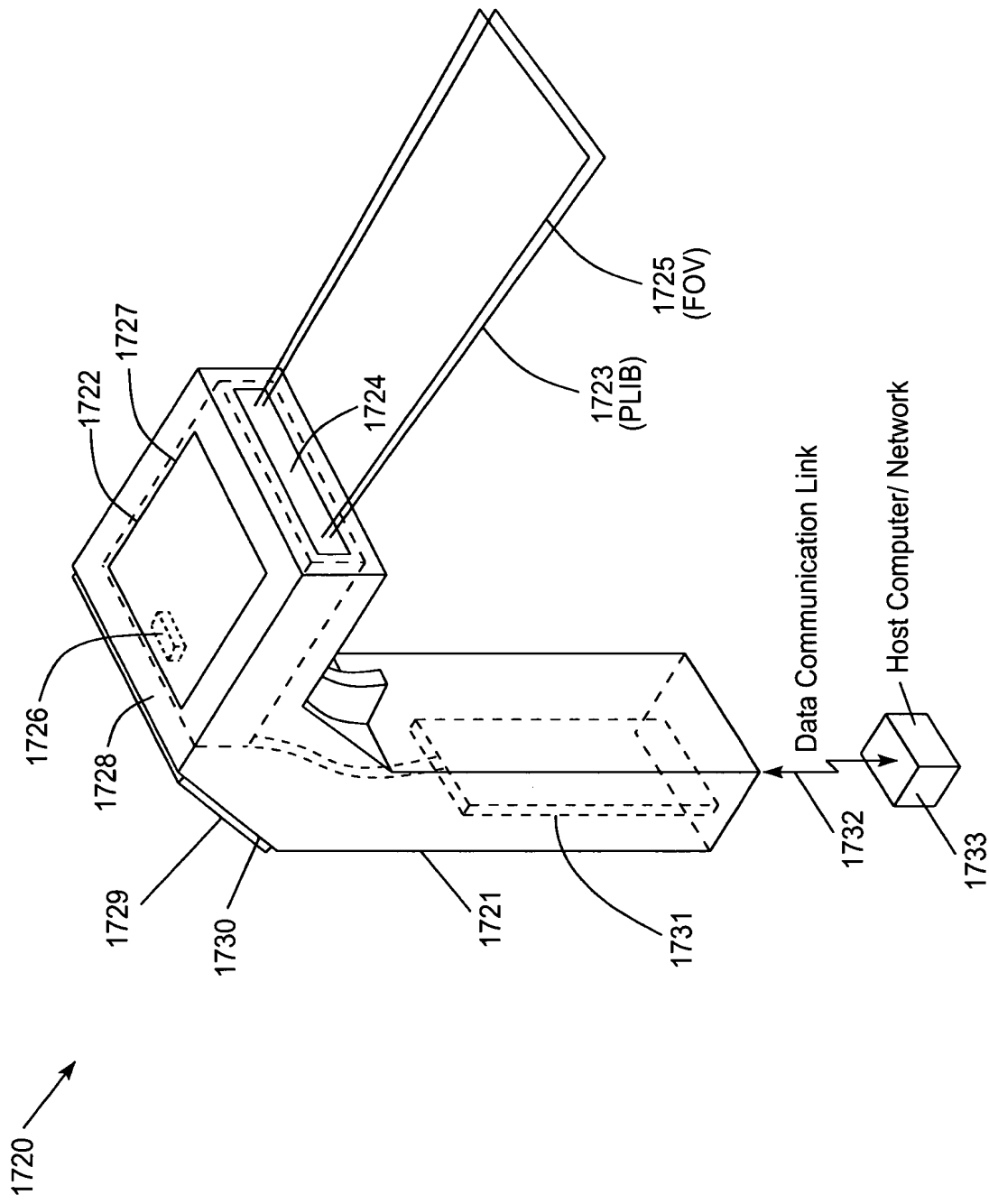


FIG. 48A

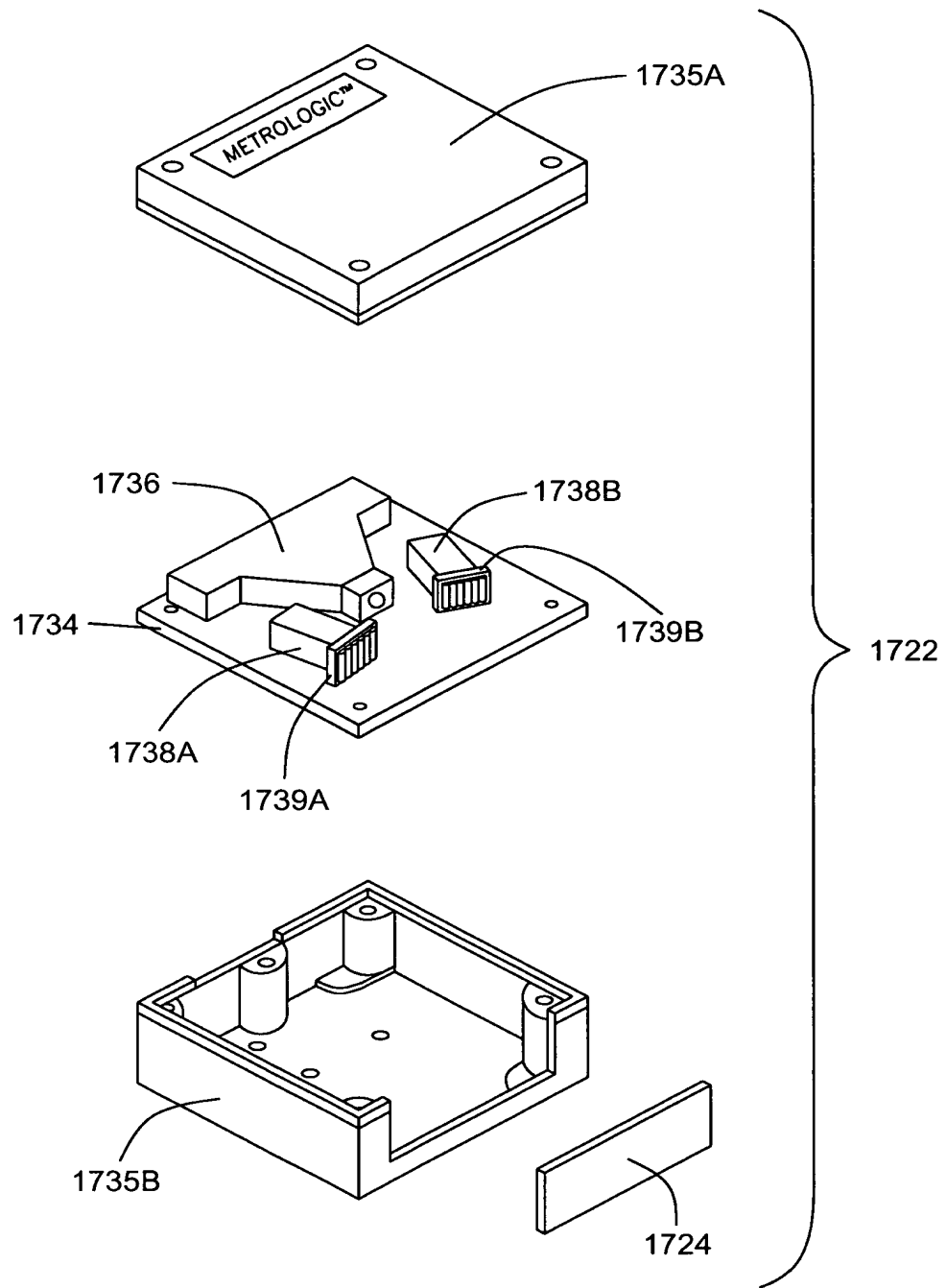


FIG. 48B

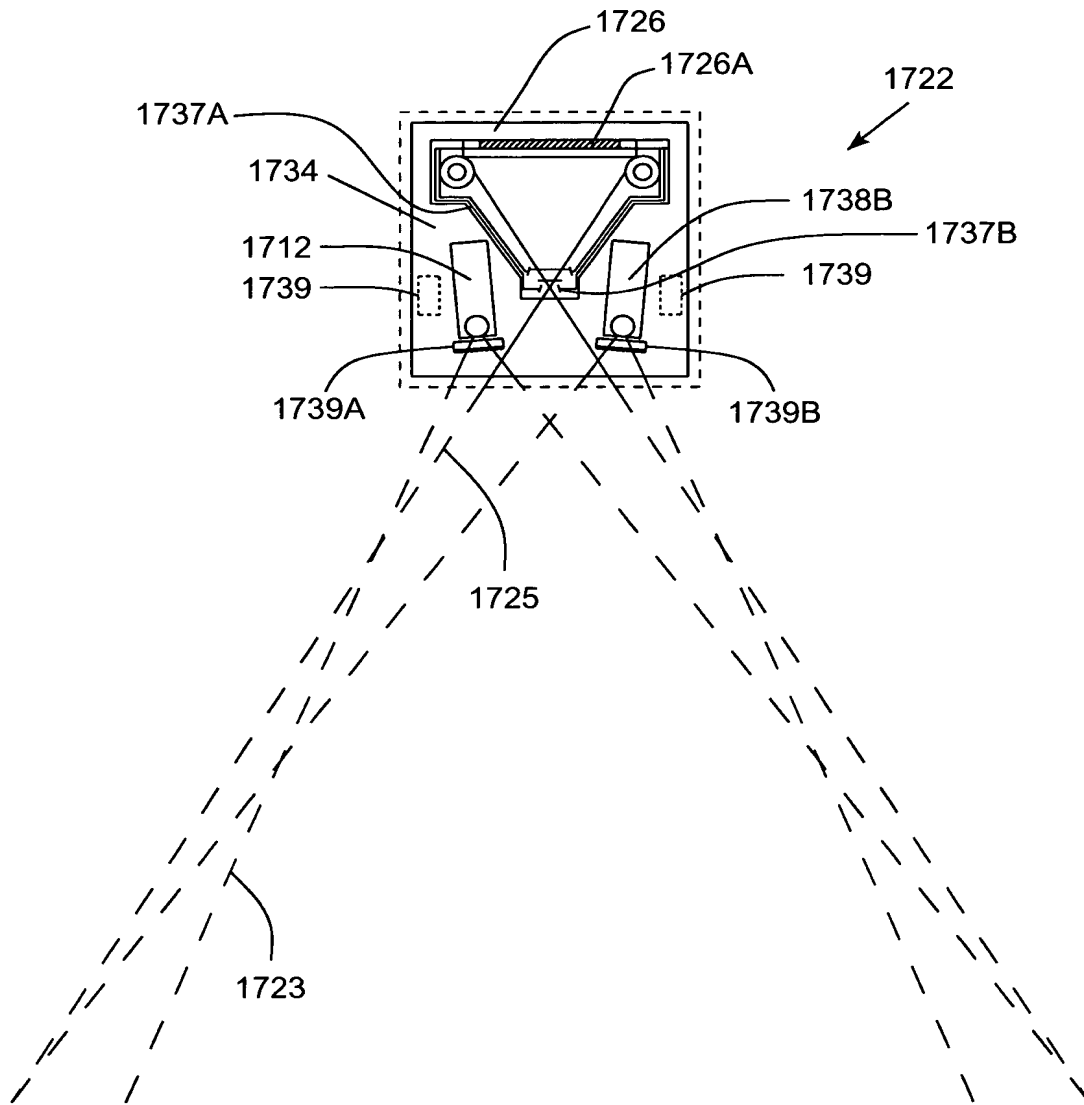


FIG. 48C

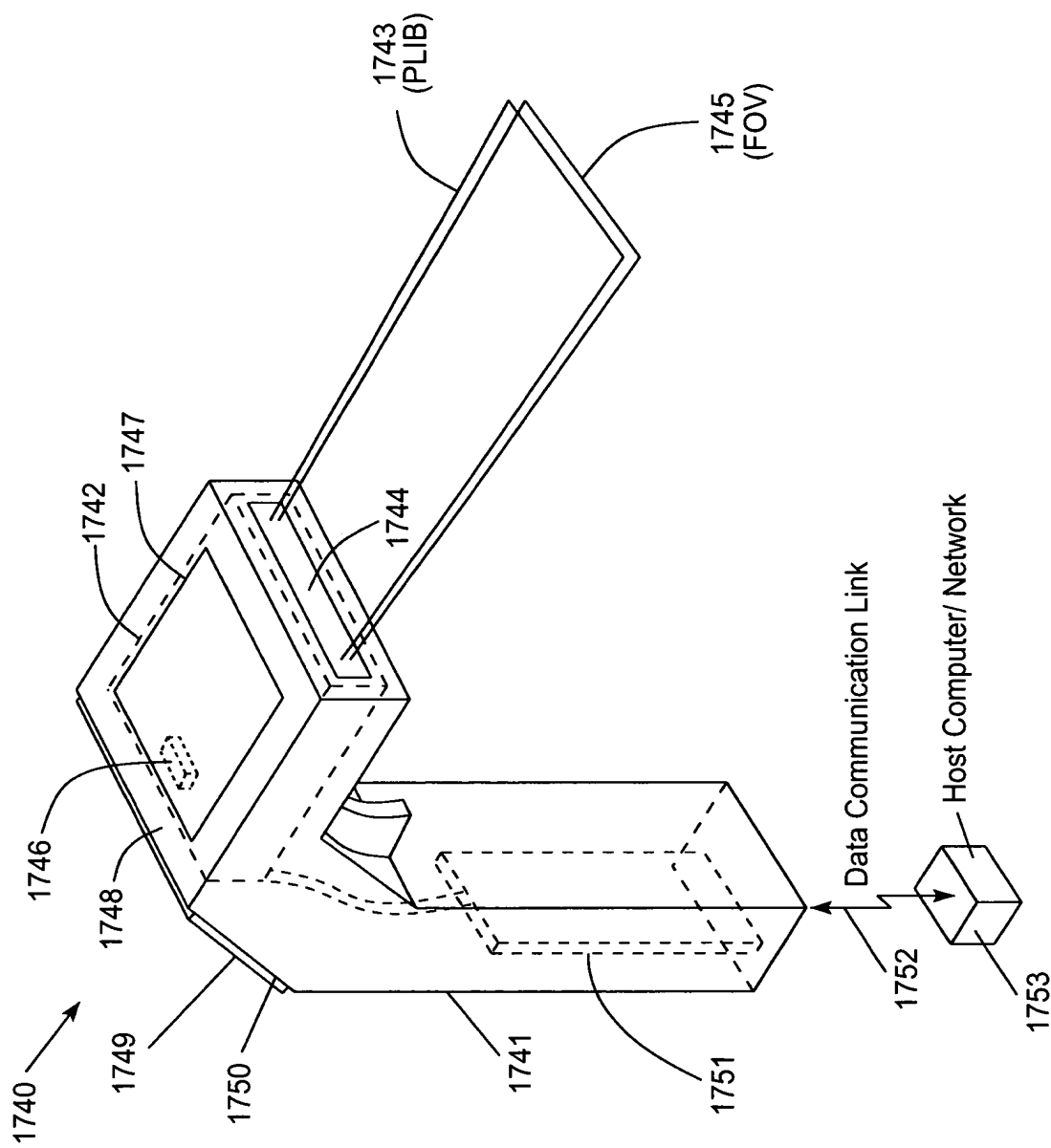


FIG. 49A

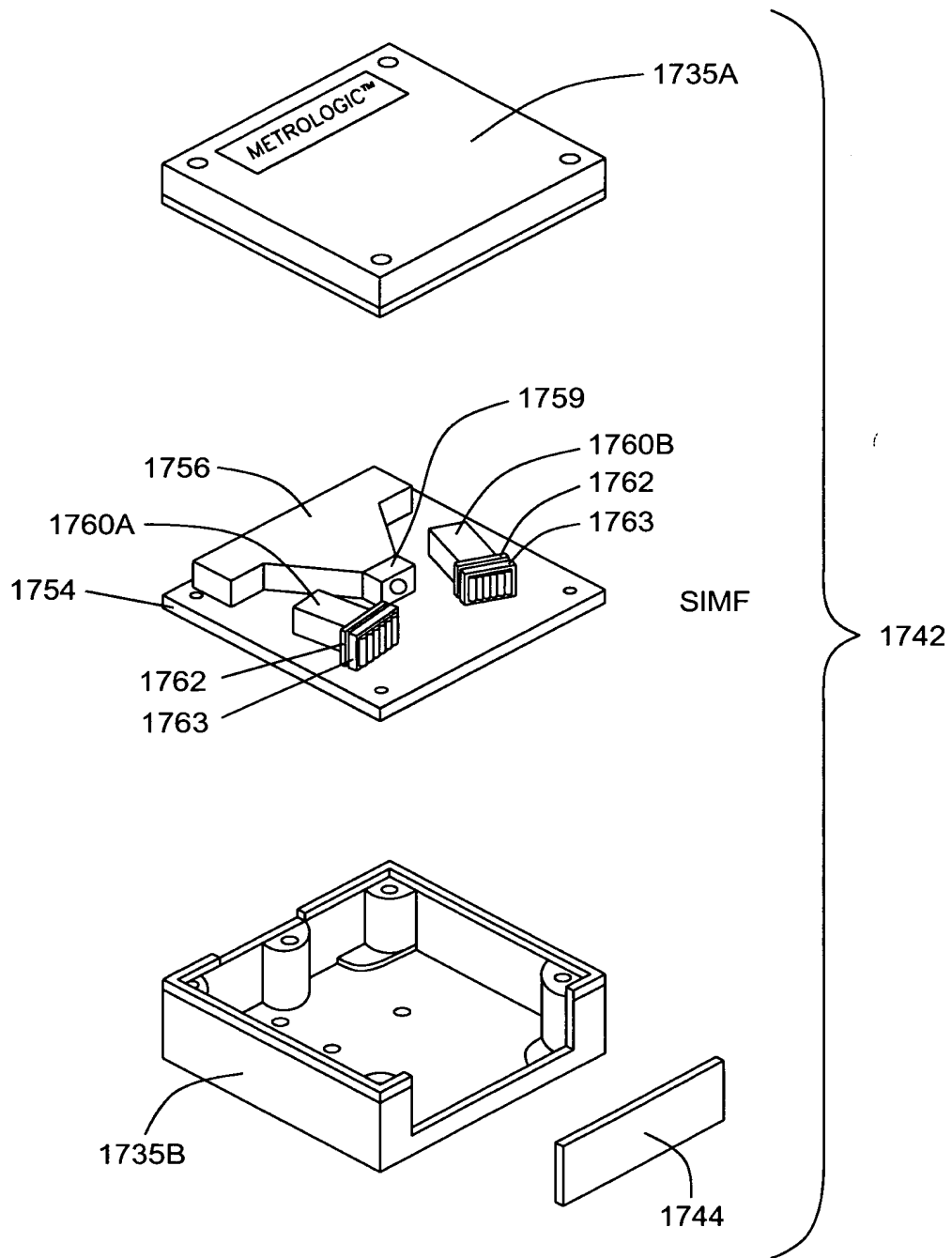


FIG. 49B

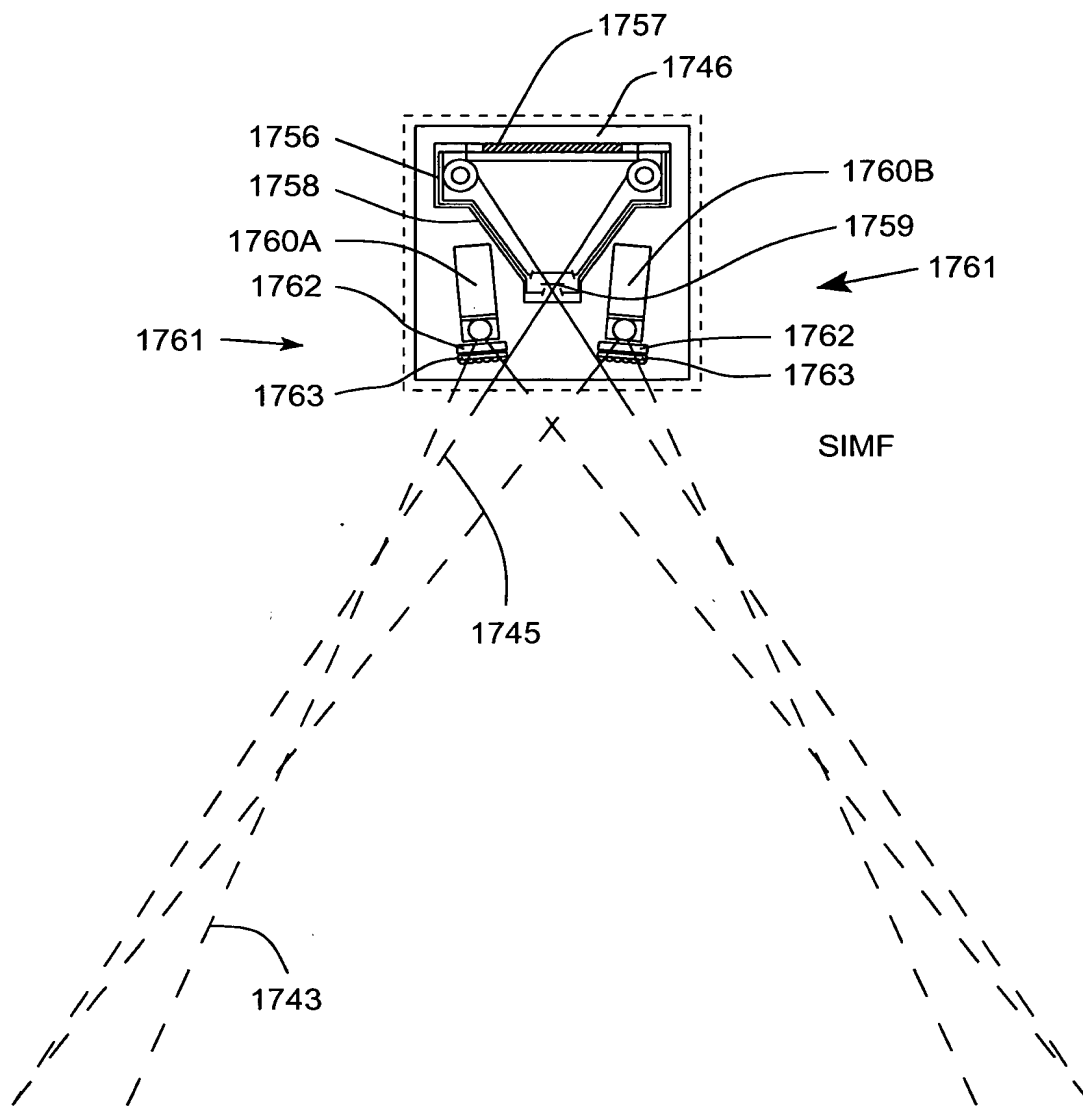


FIG. 49C

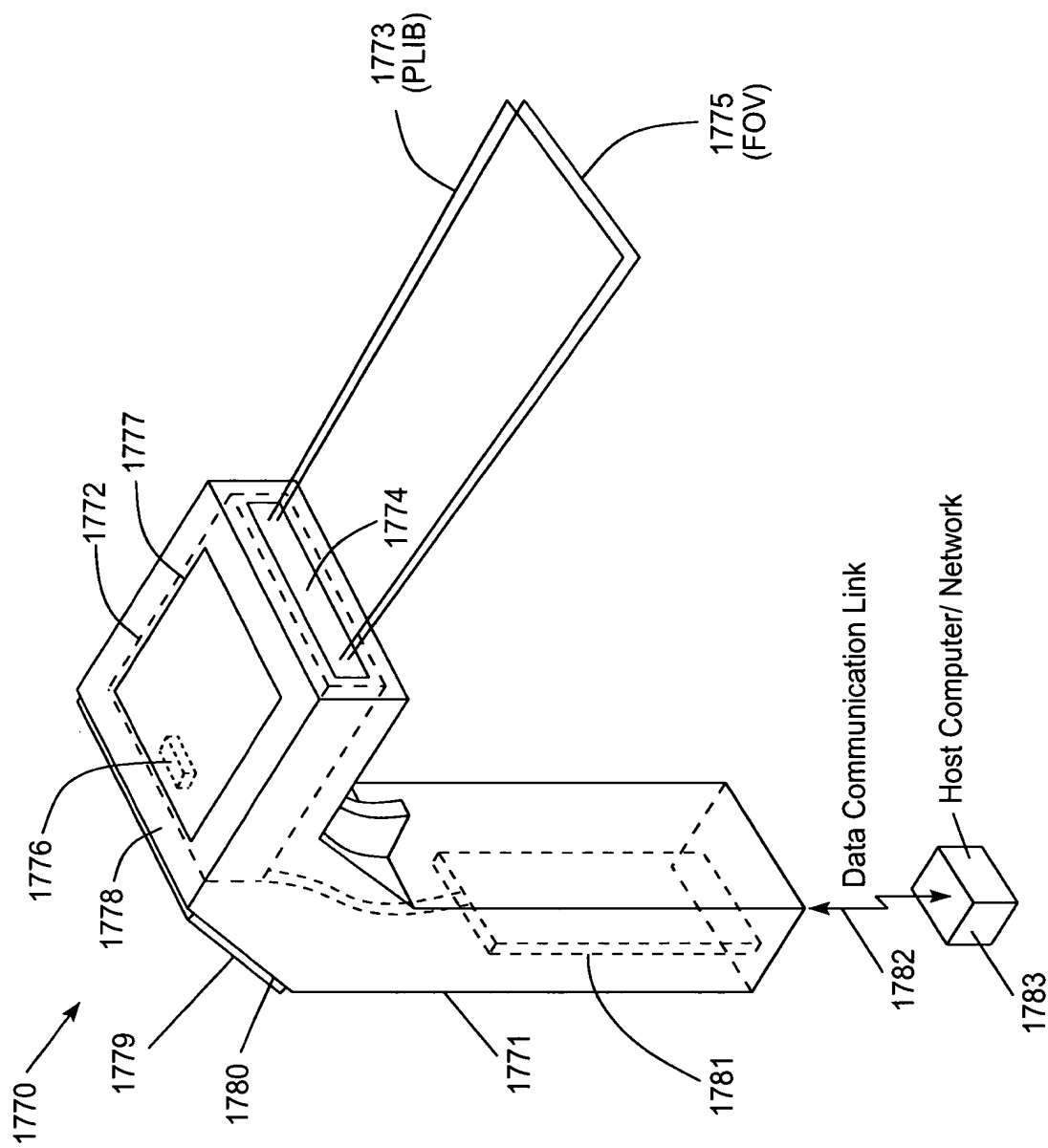


FIG. 50A

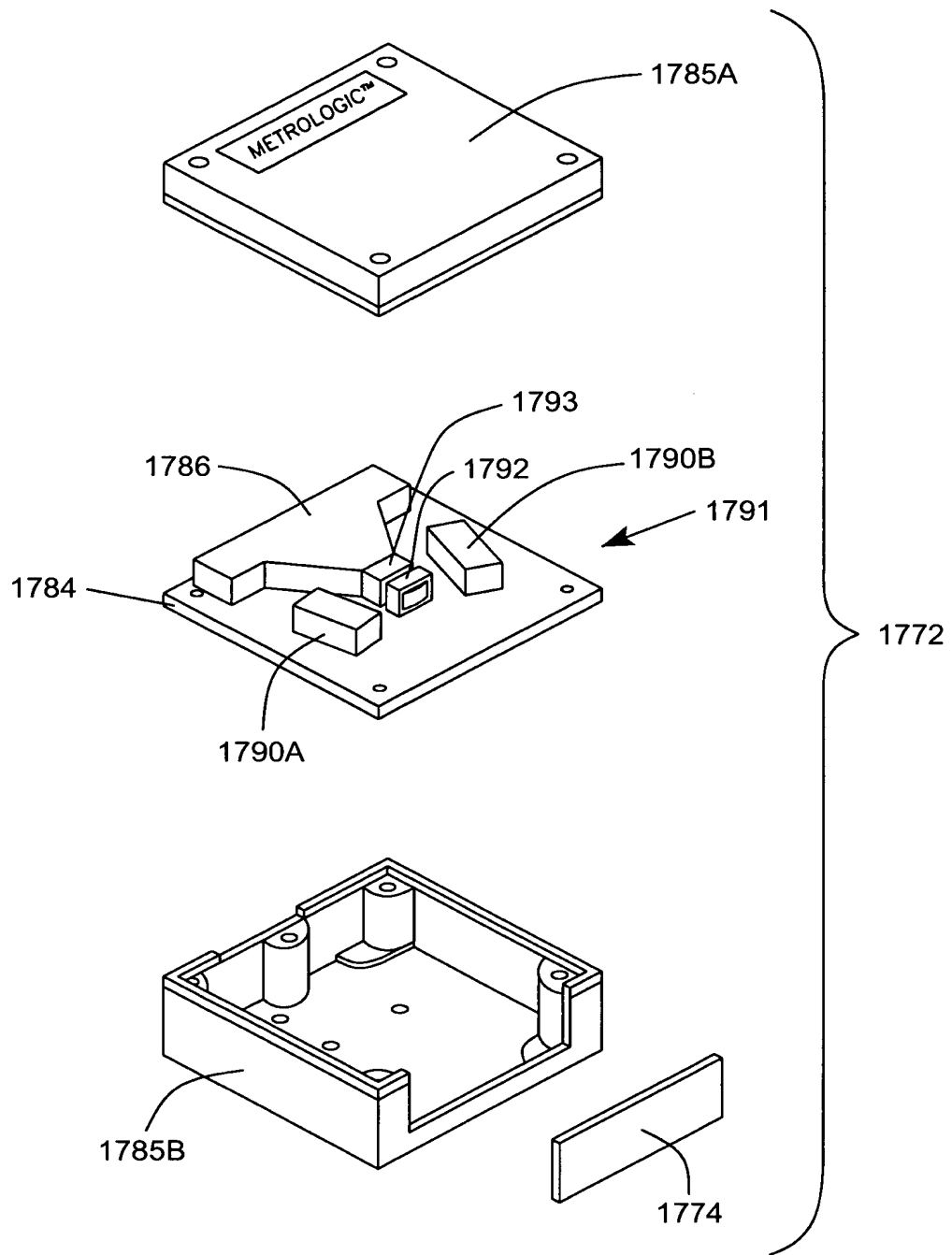


FIG. 50B

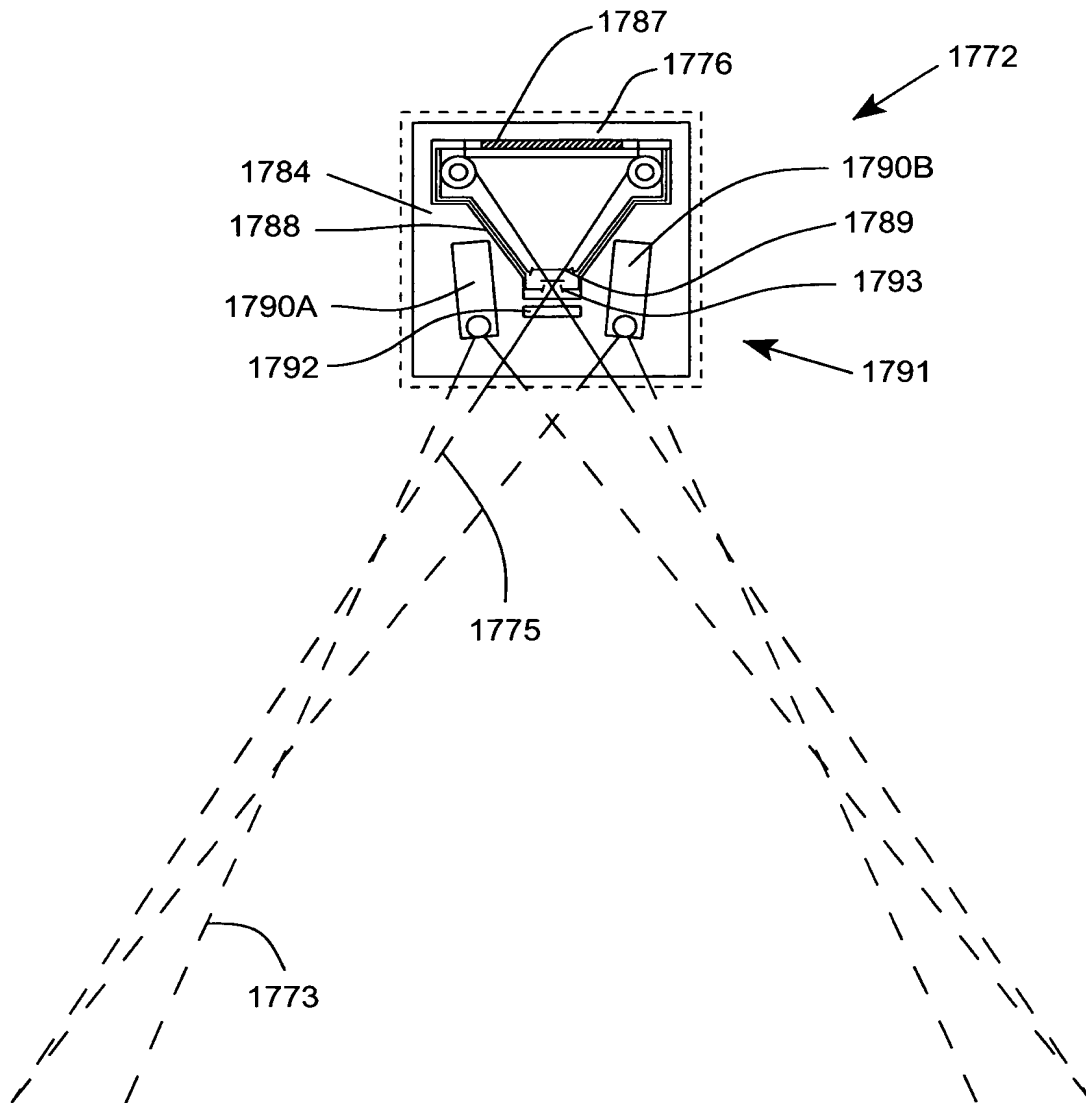


FIG. 50C

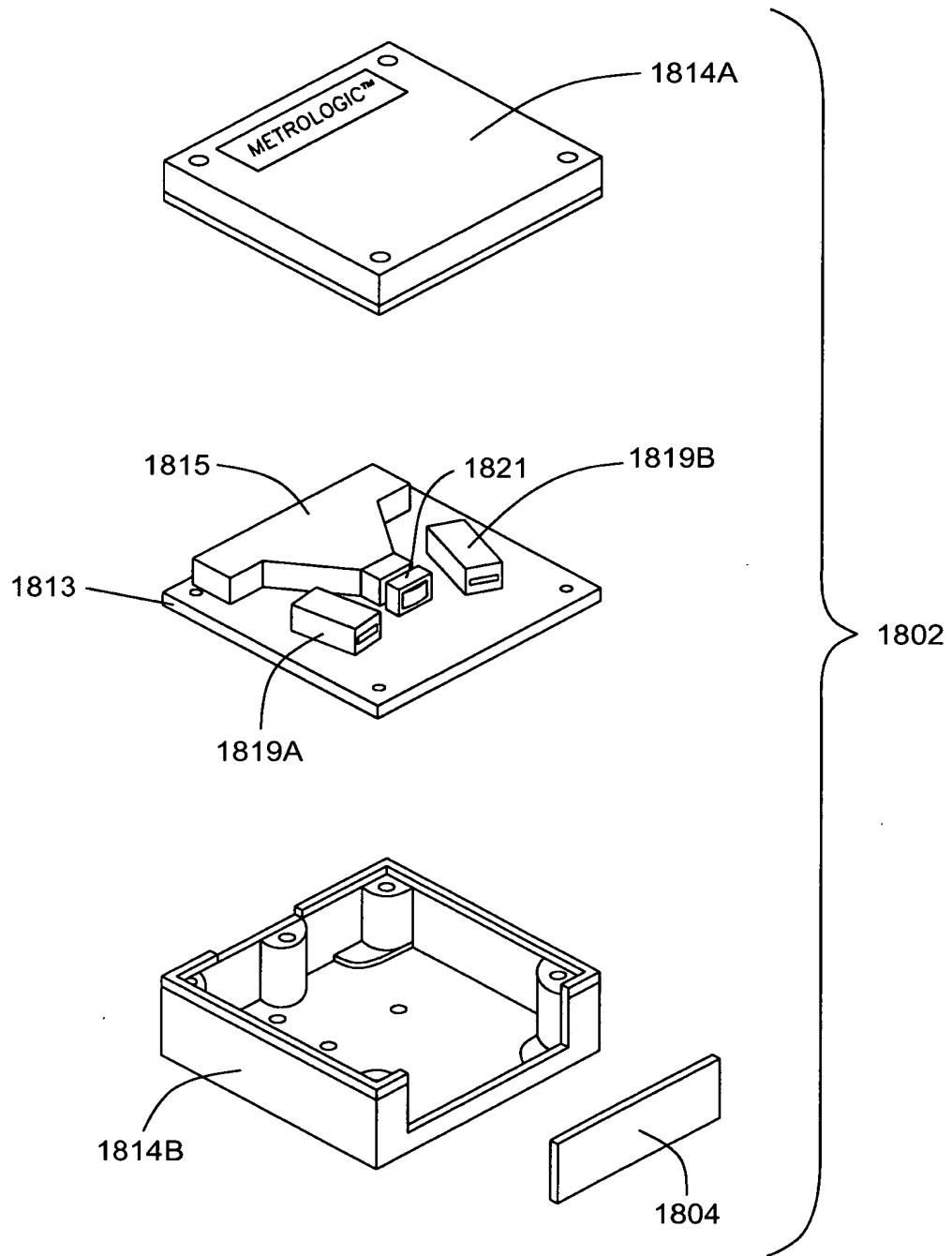


FIG. 51B

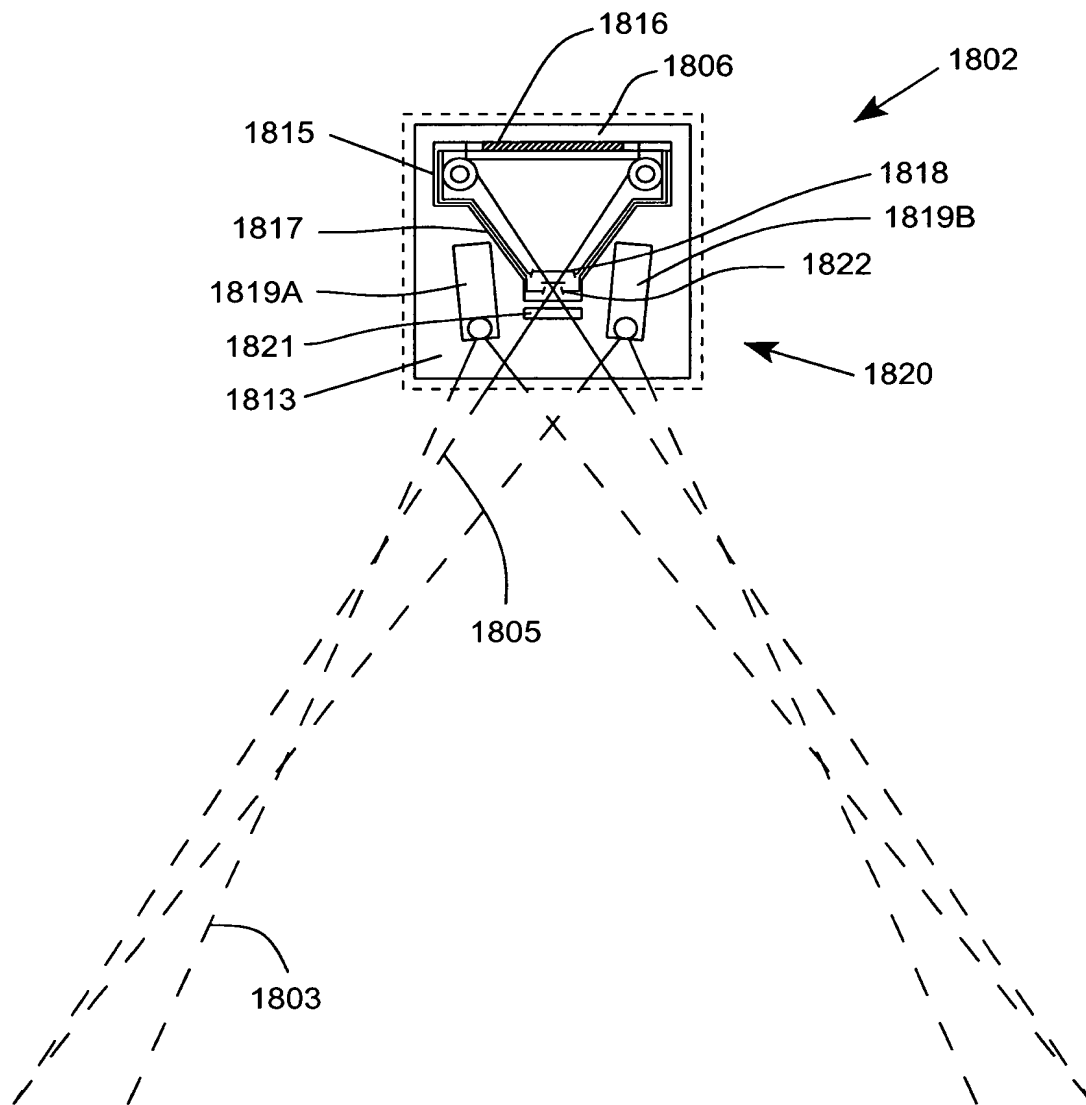
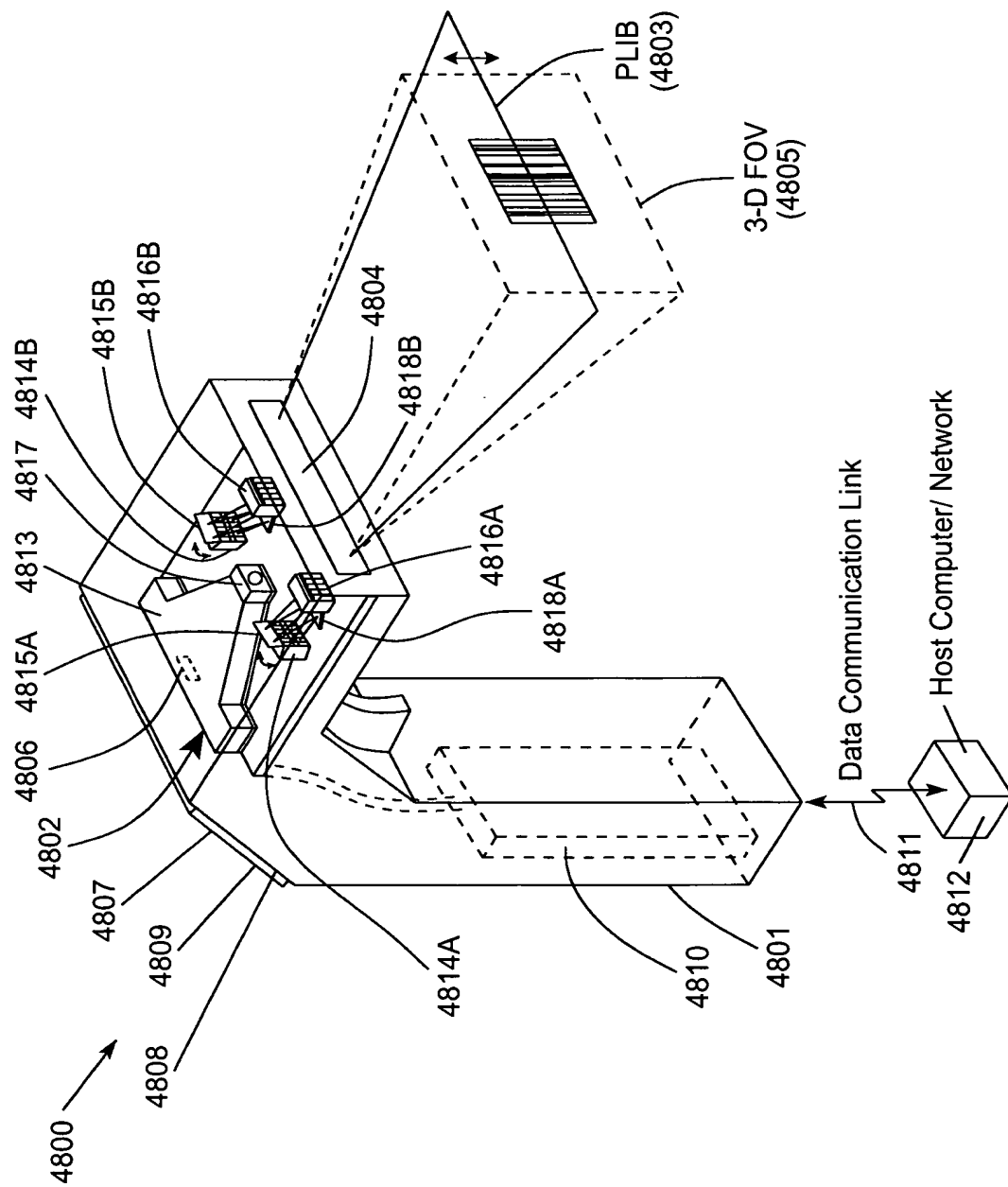


FIG. 51C



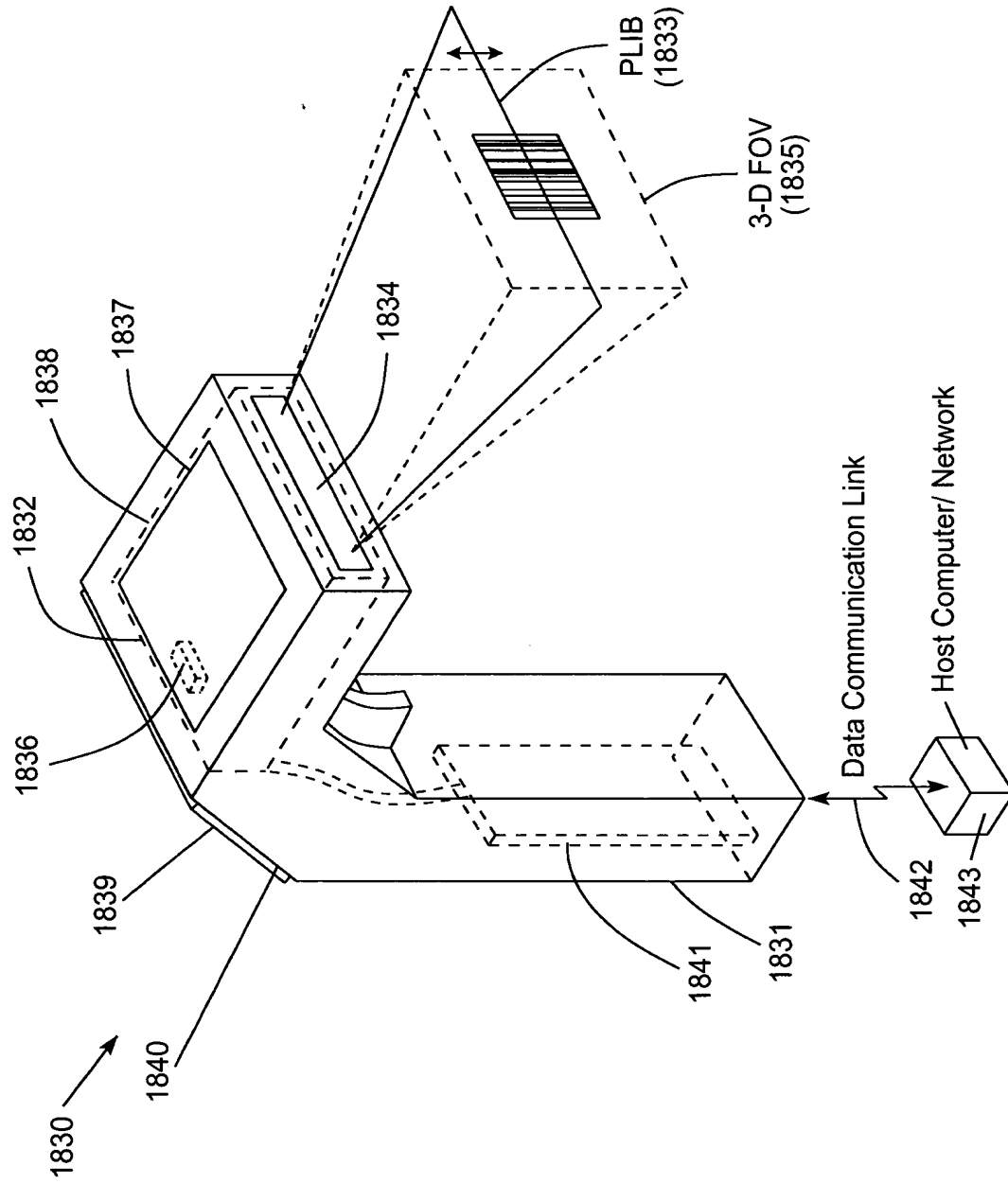


FIG. 52A

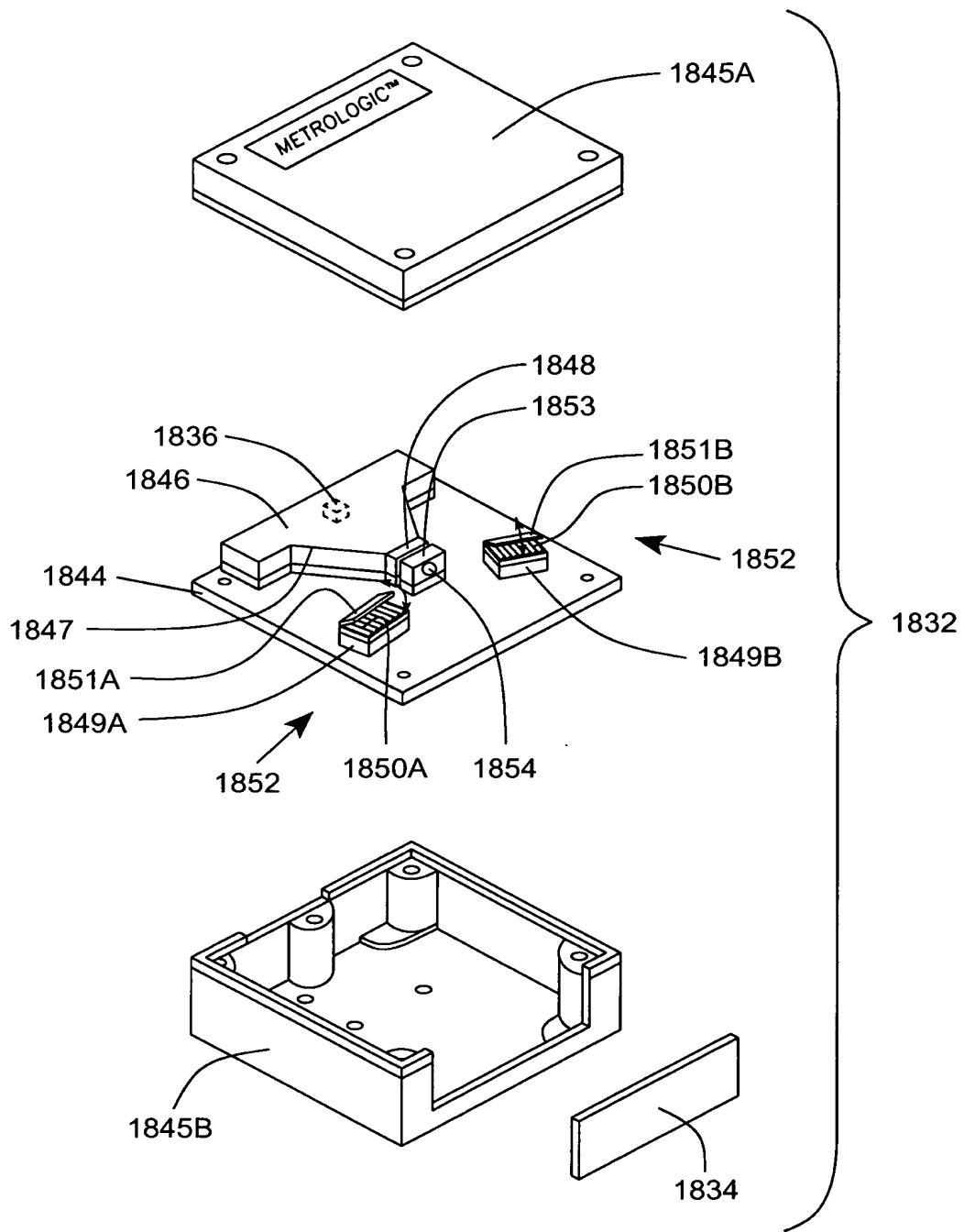
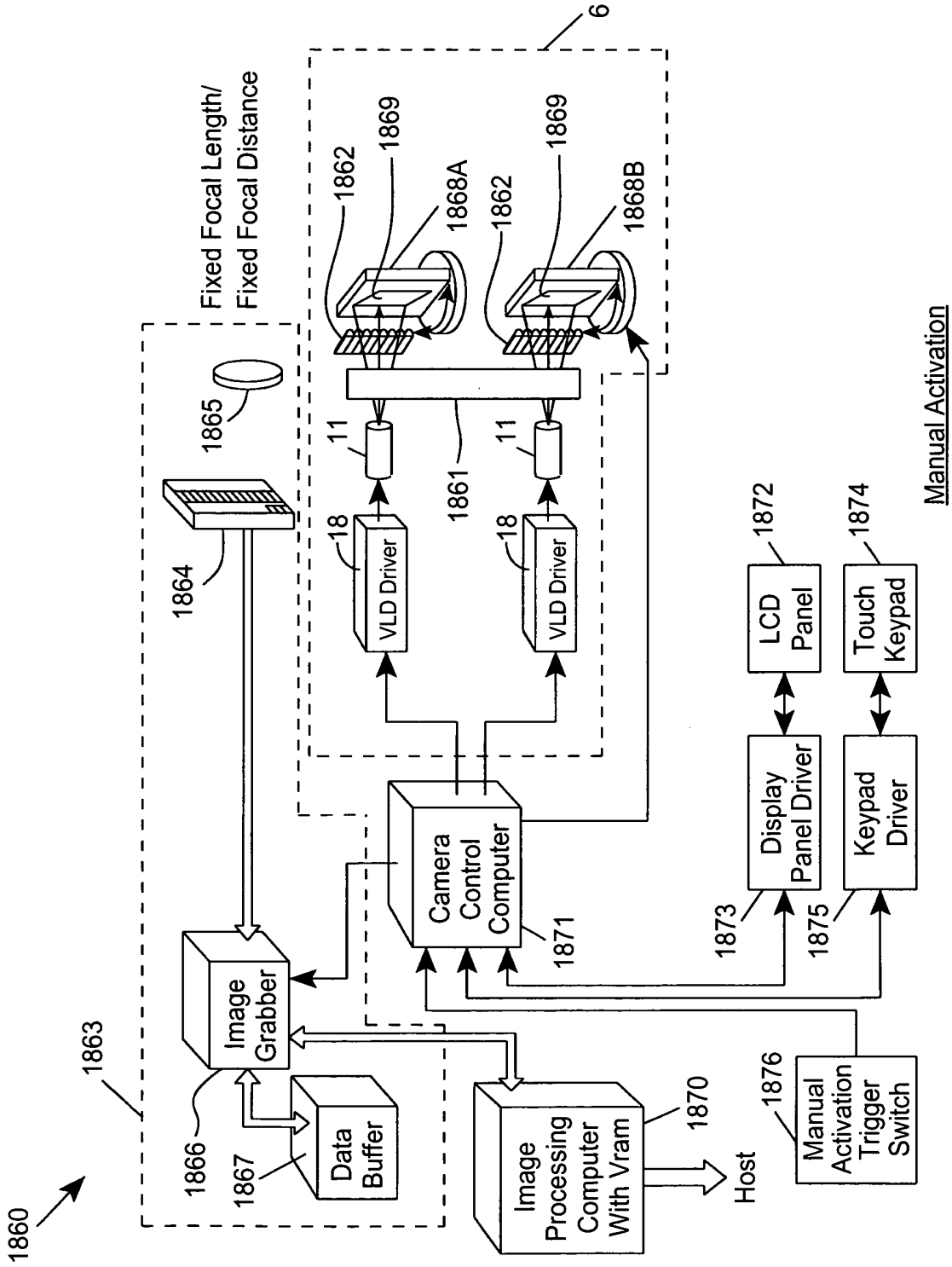


Fig. 113A-3B

FIG. 52B



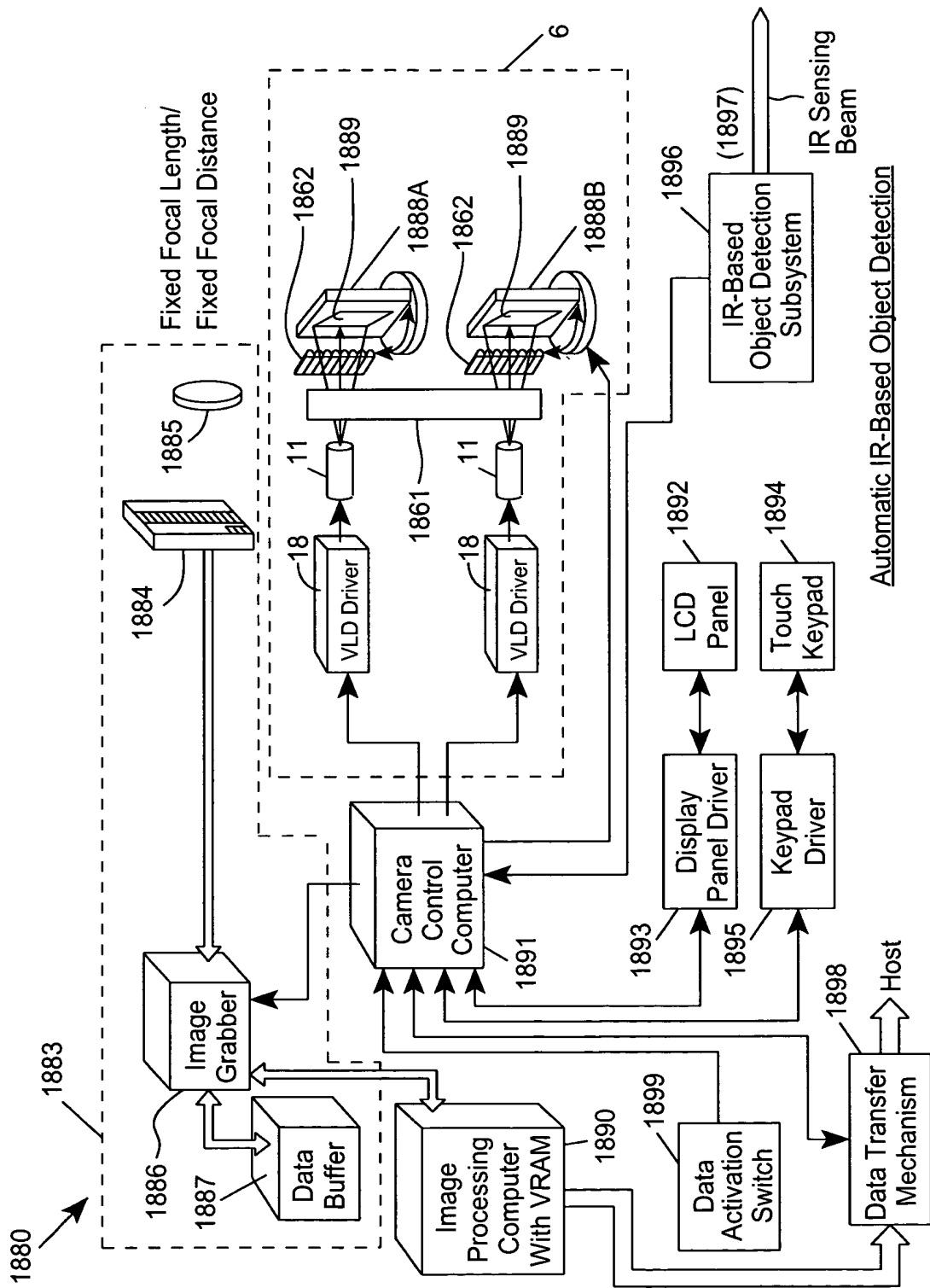


FIG. 53A2

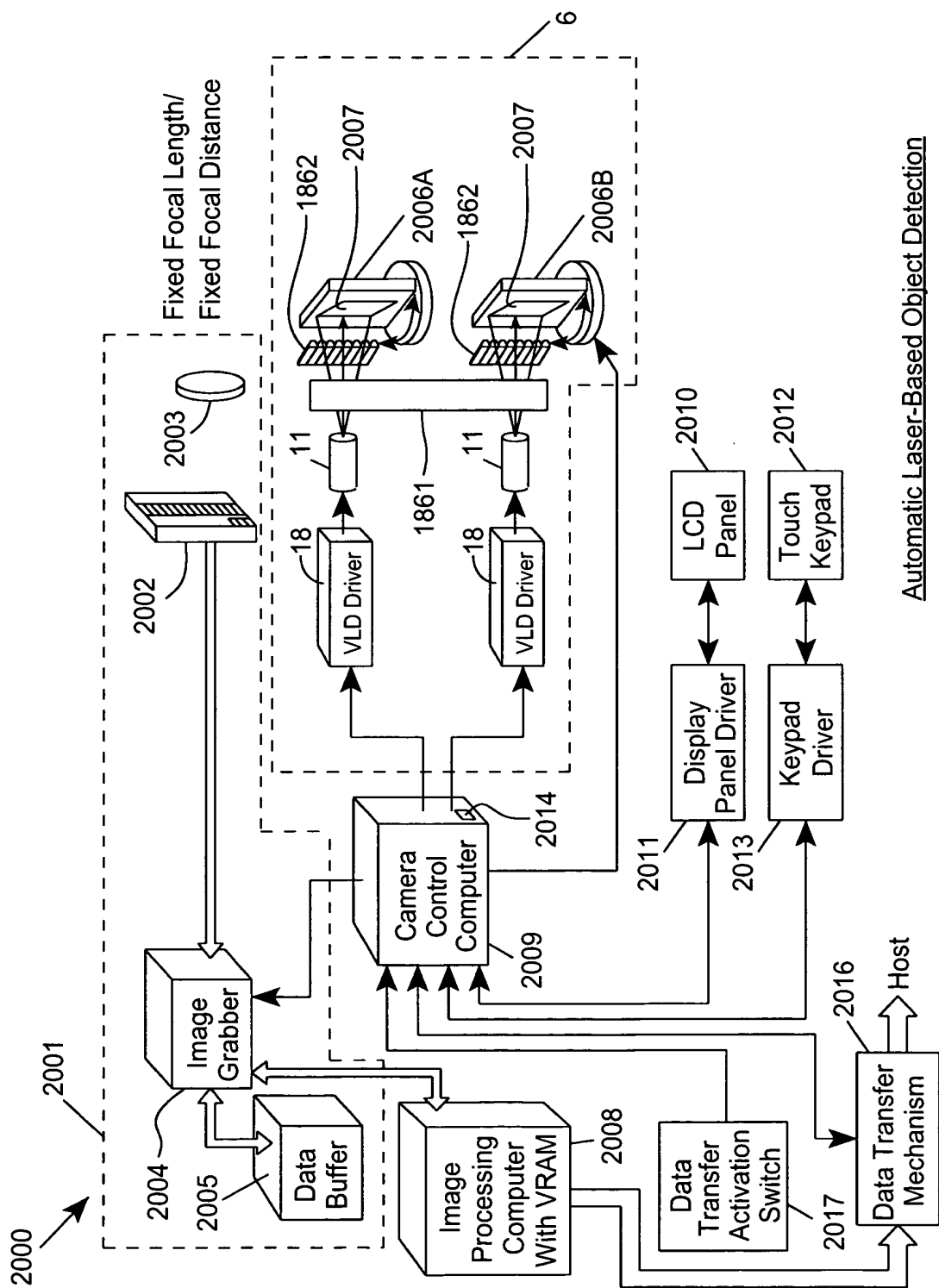


FIG. 53A3

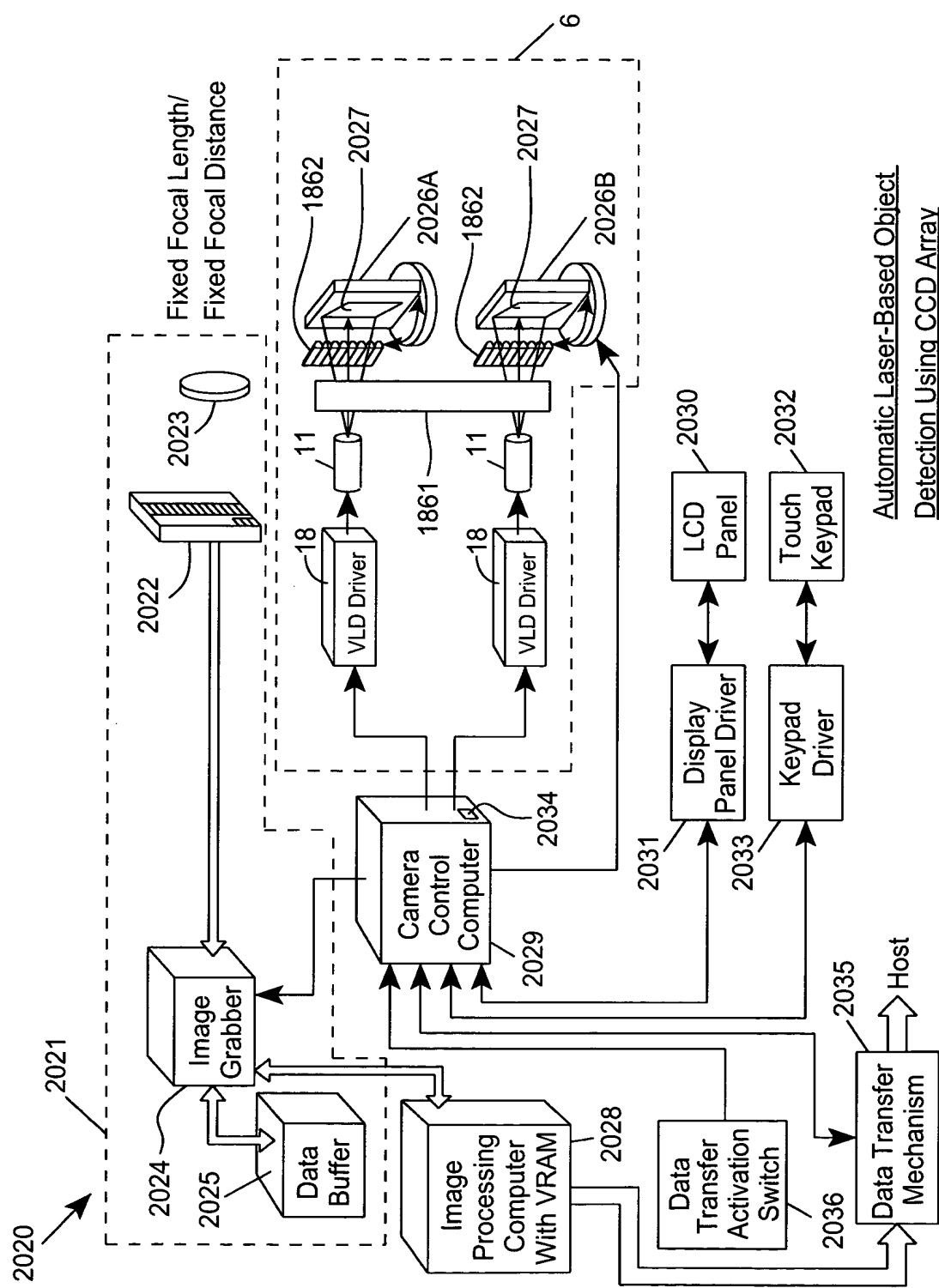


FIG. 53A4

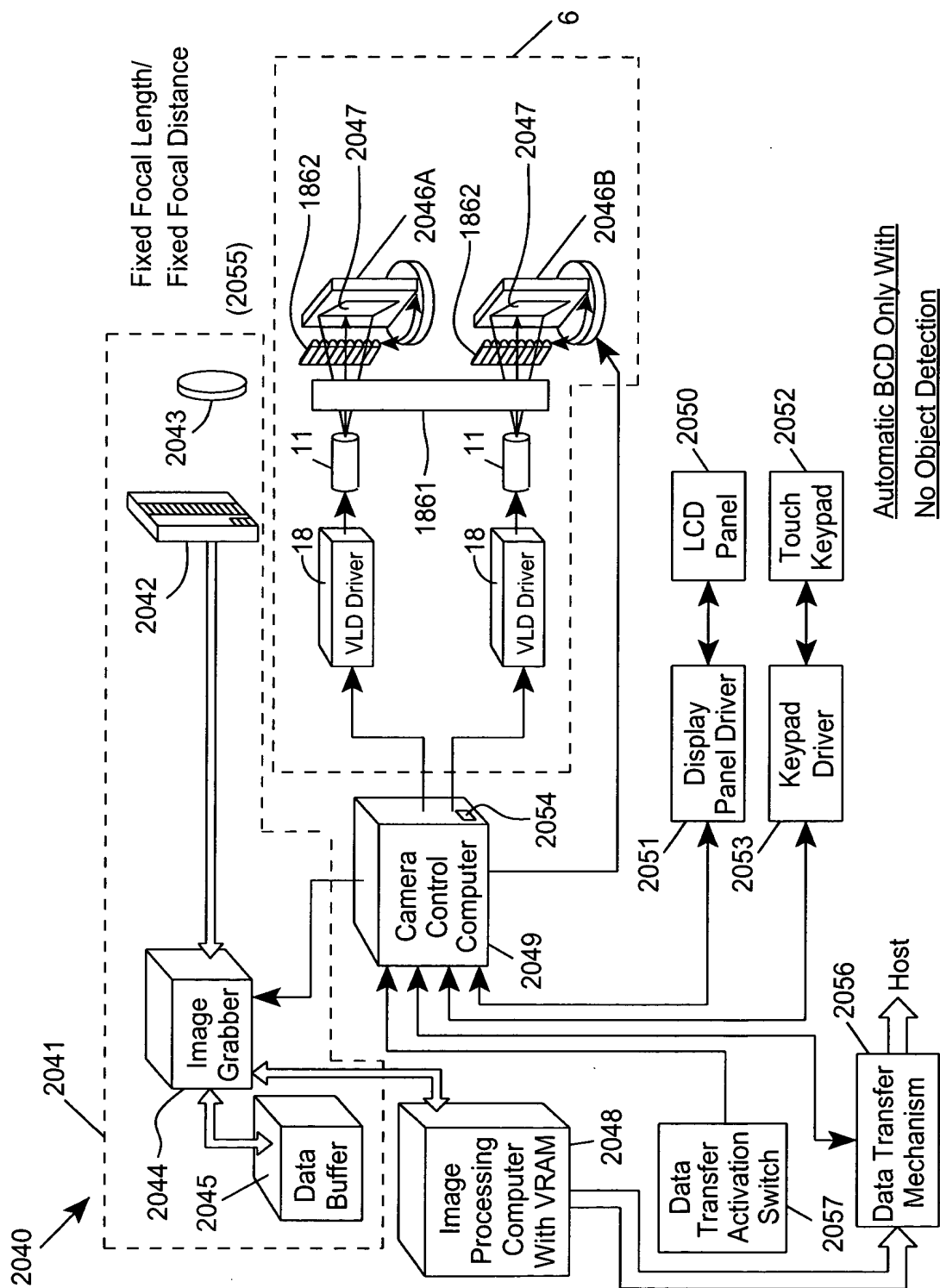


FIG. 53A5

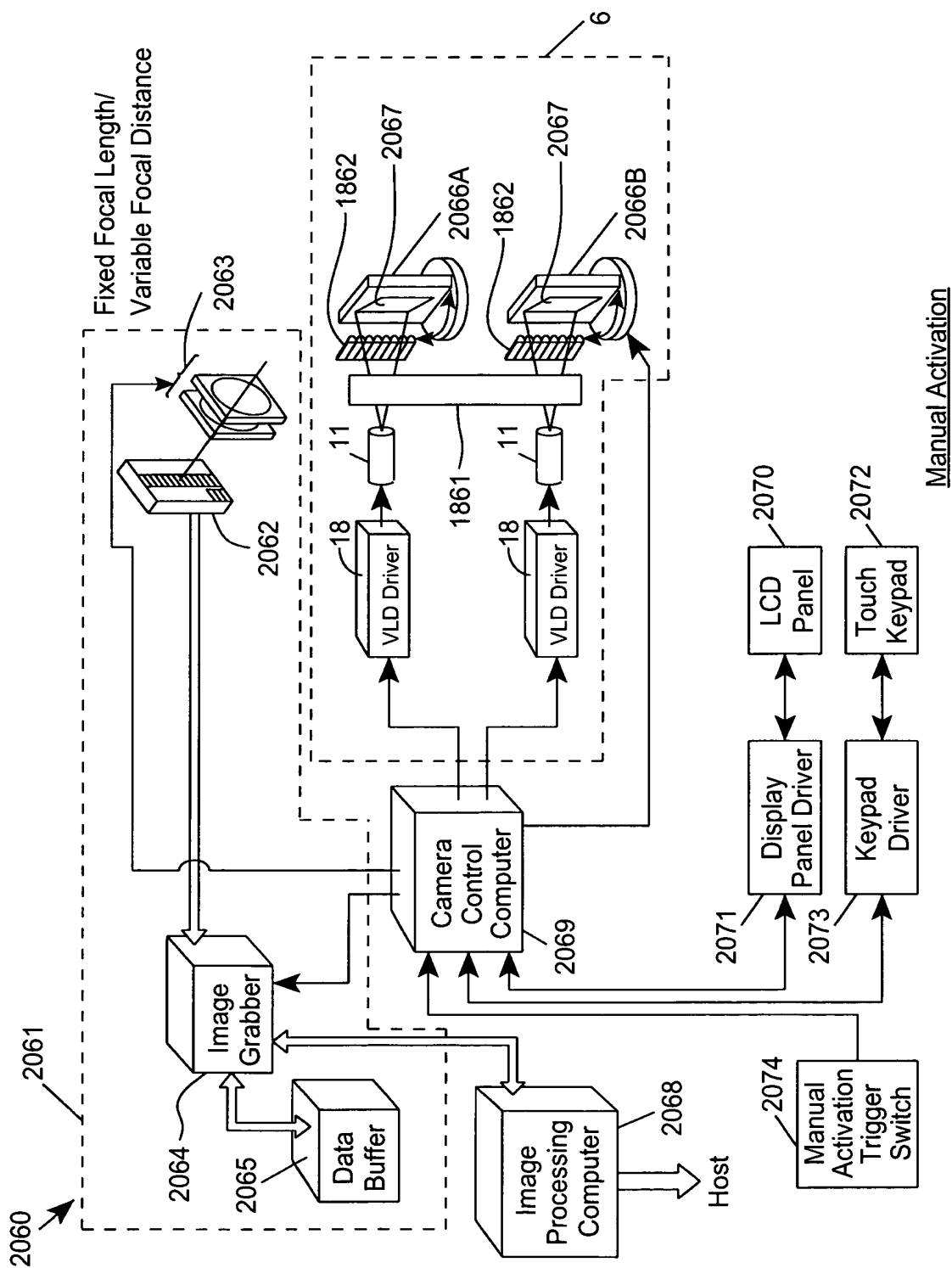


FIG. 53B1

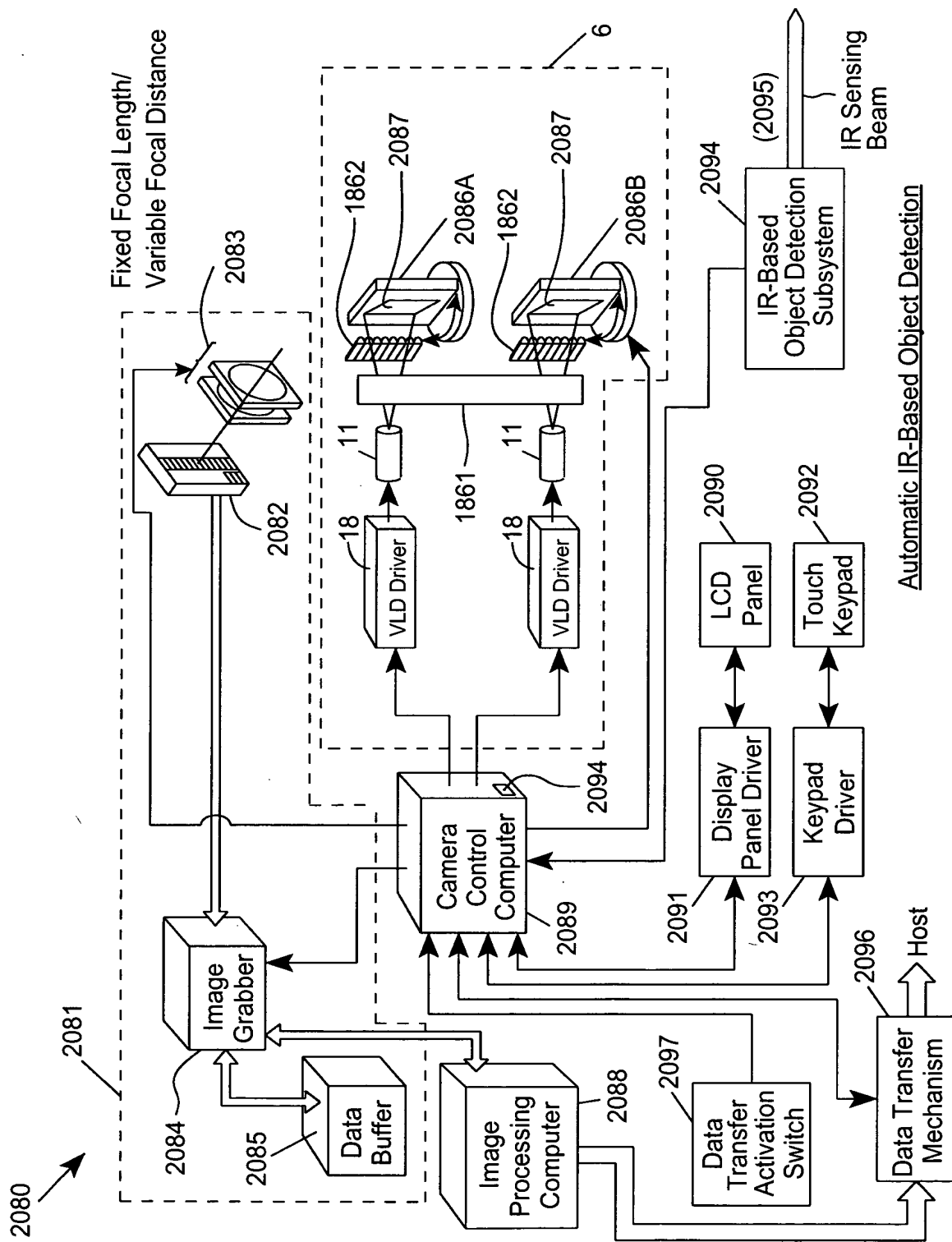
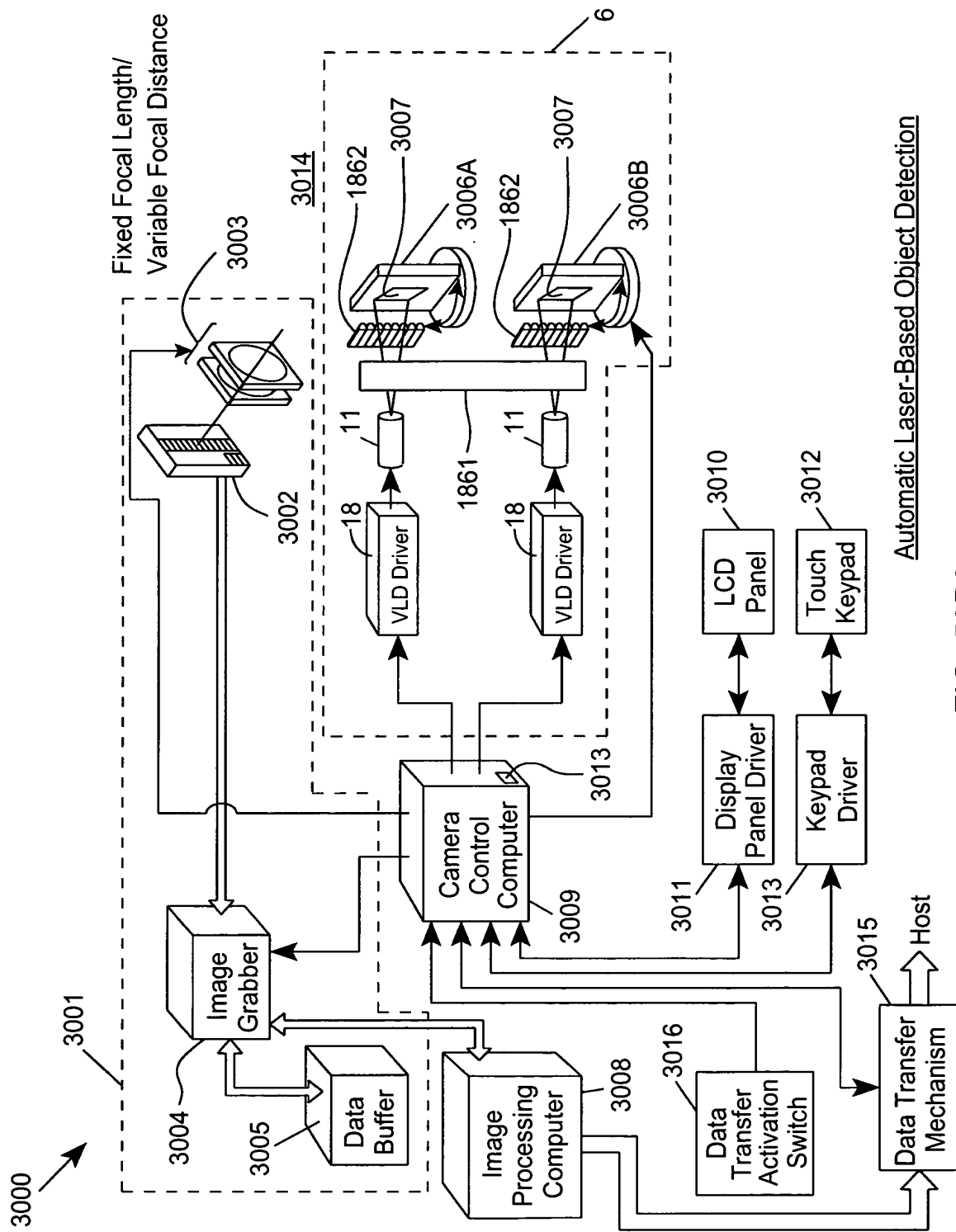


FIG. 53B2



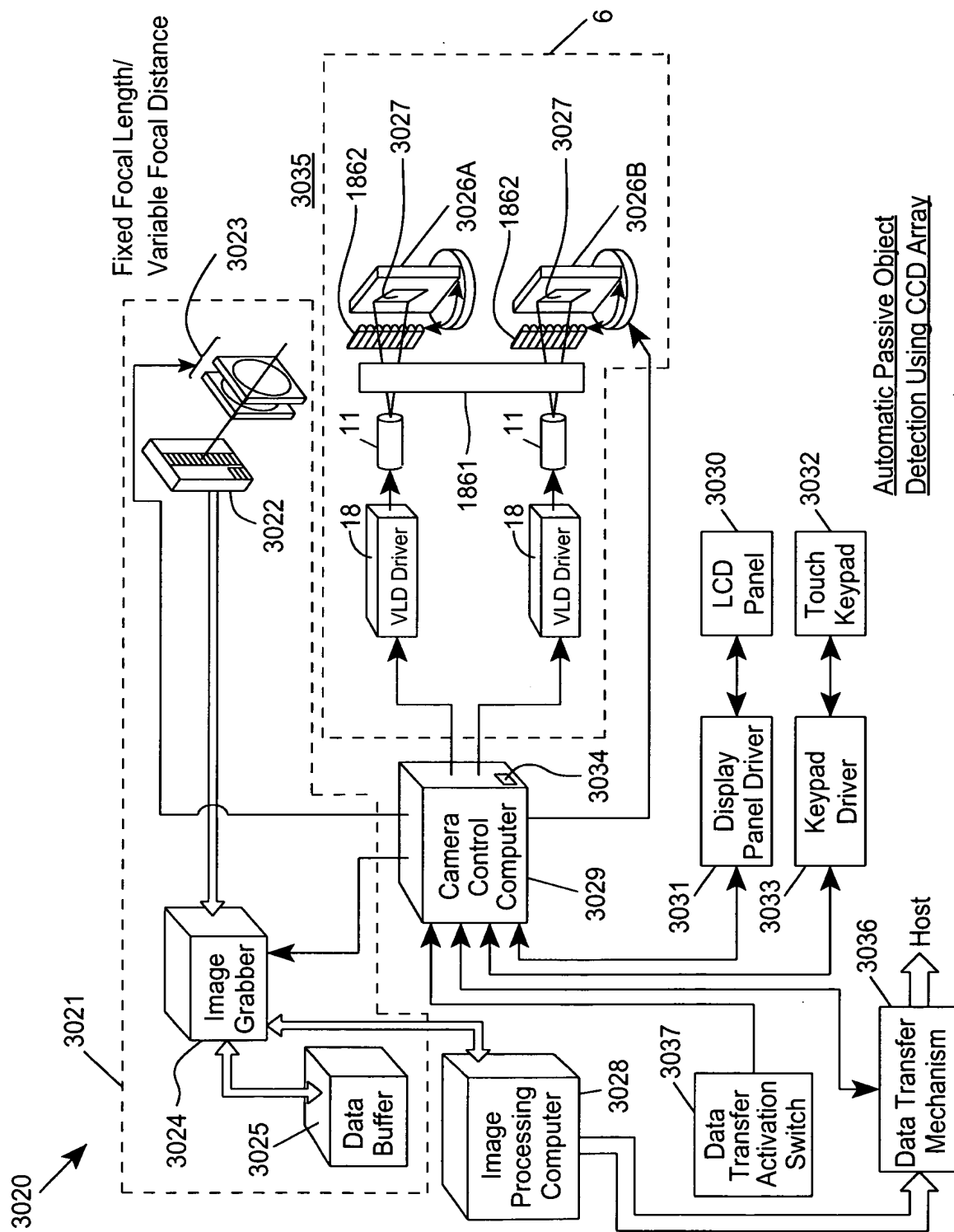


FIG. 53B4

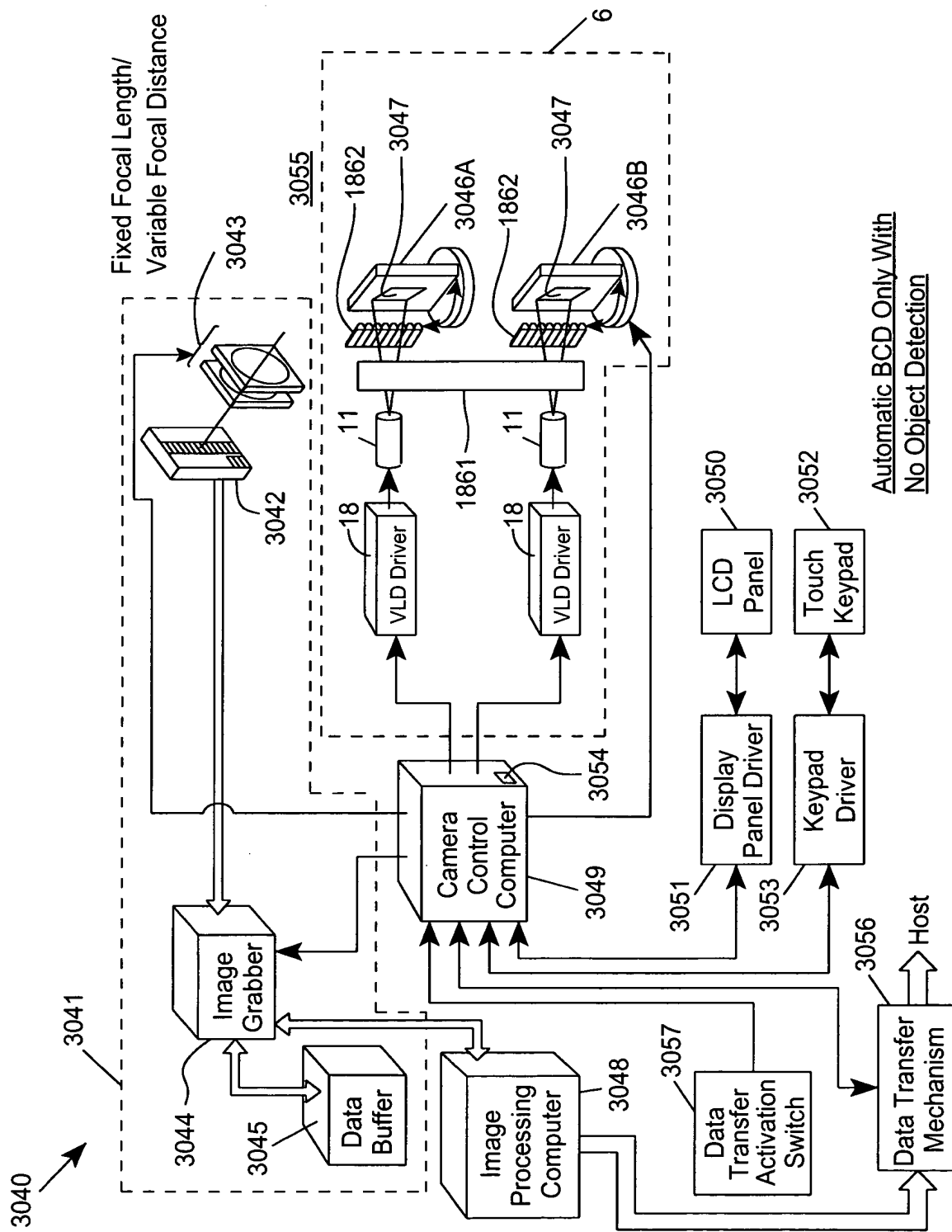


FIG. 53B5

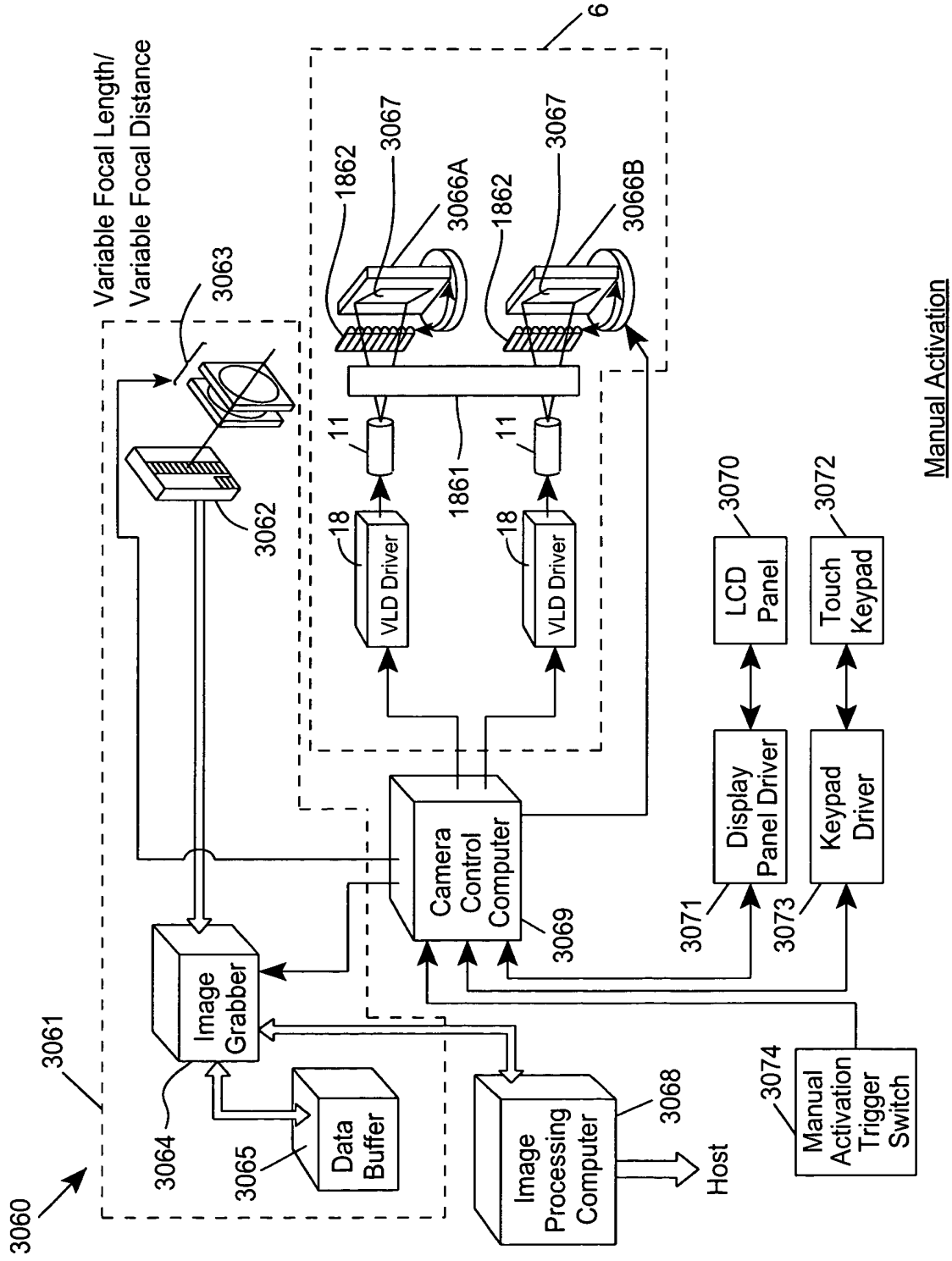


FIG. 53C1

Manual Activation

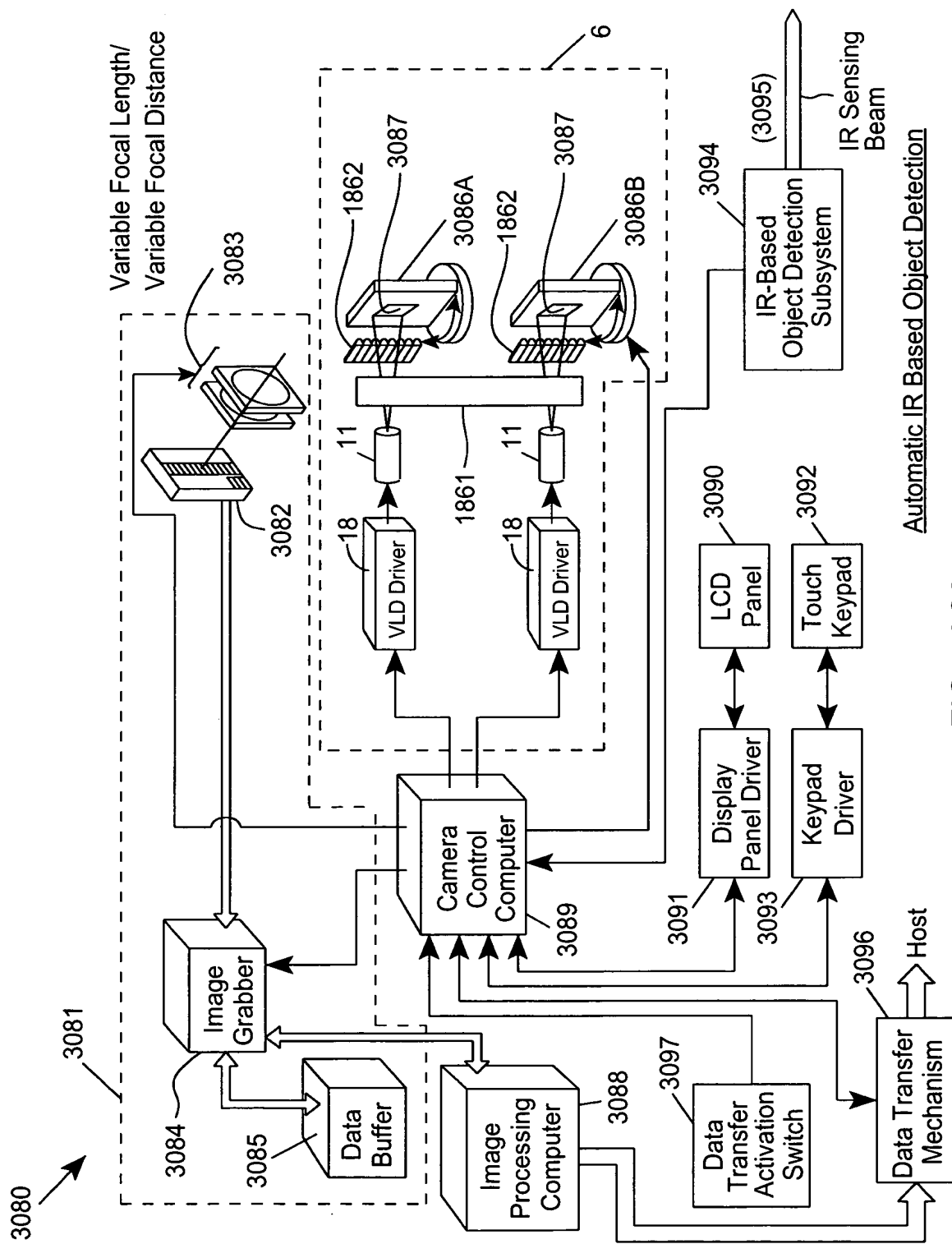
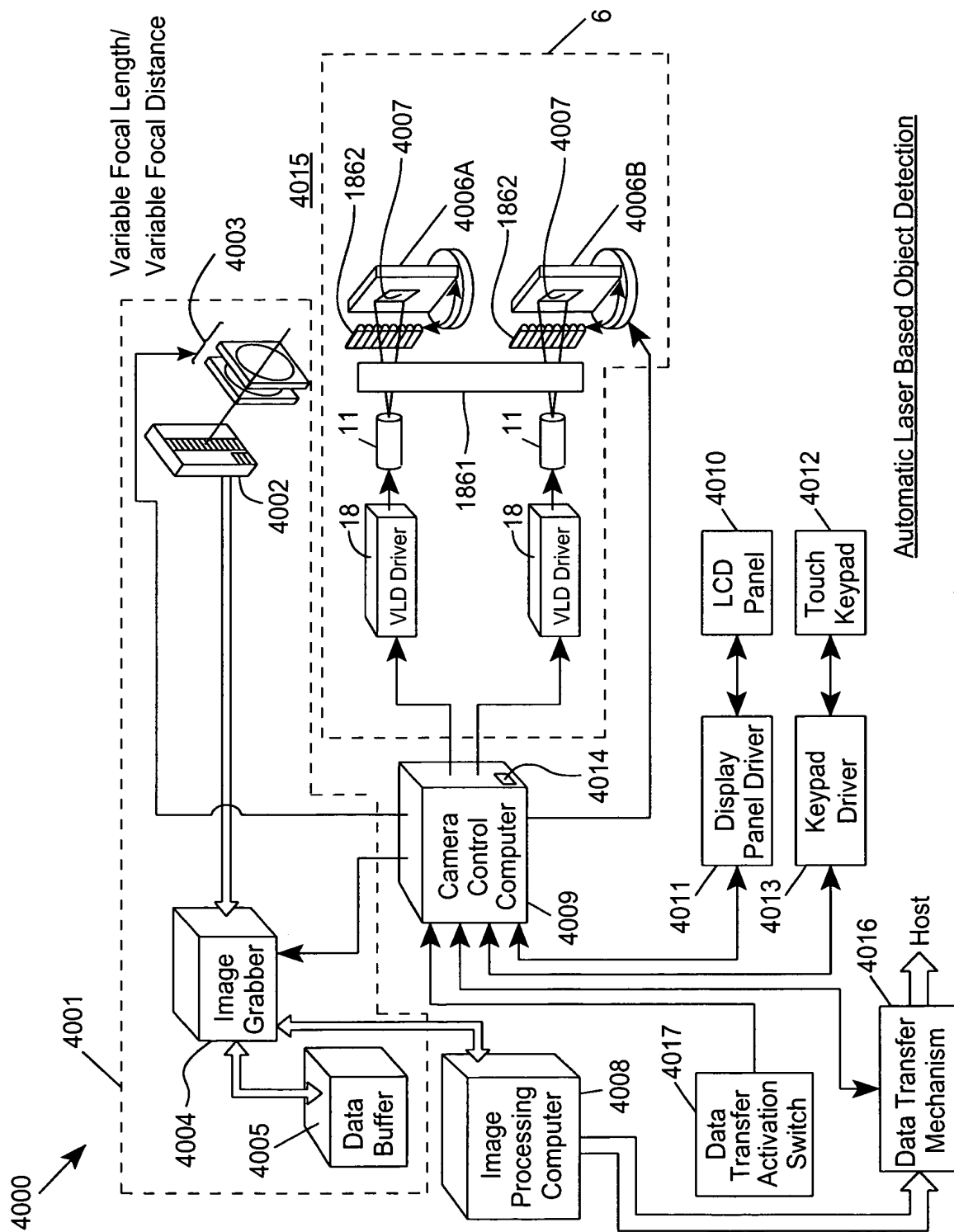


FIG. 53C2



Automatic Laser Based Object Detection

FIG. 53C3

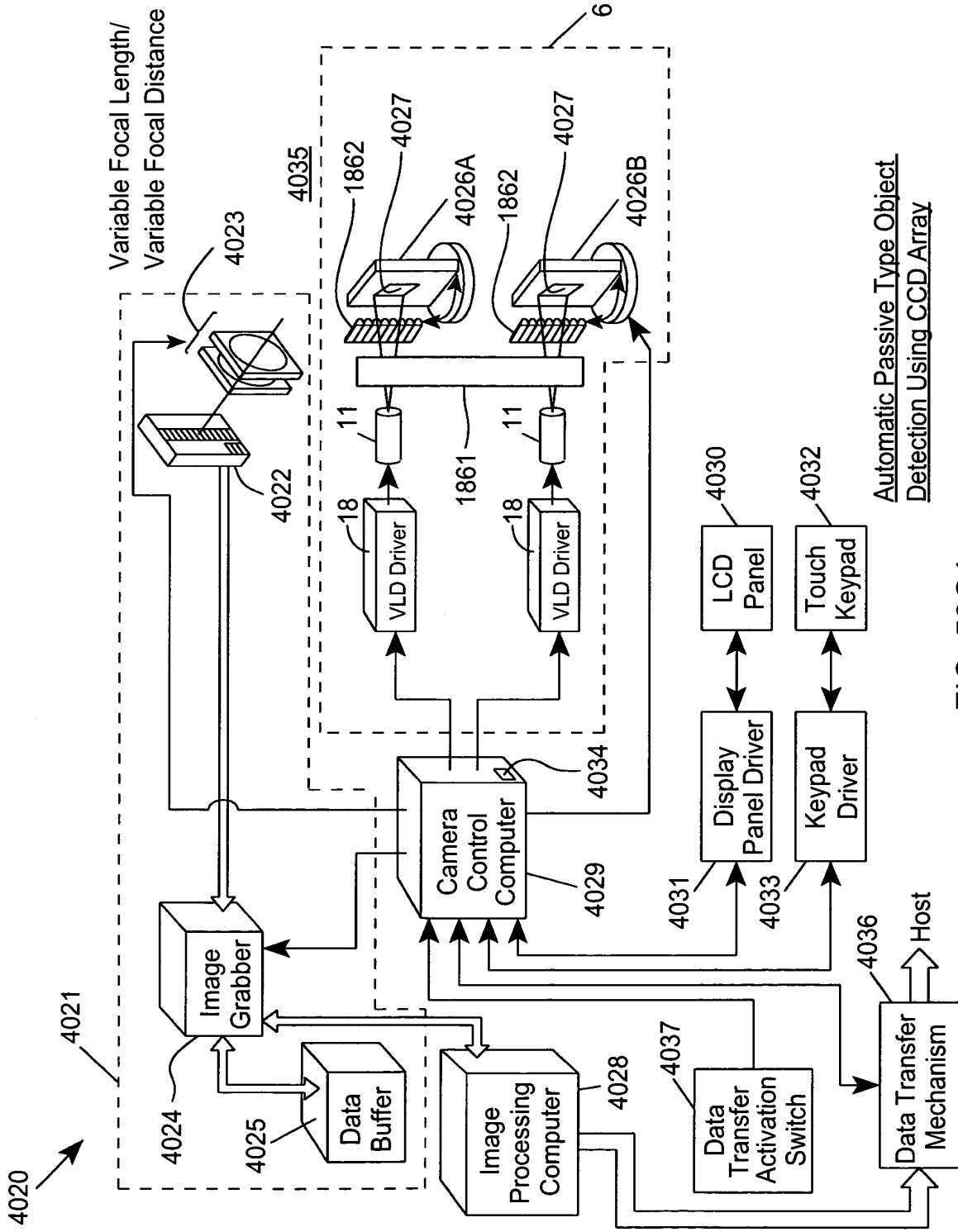


FIG. 53C4

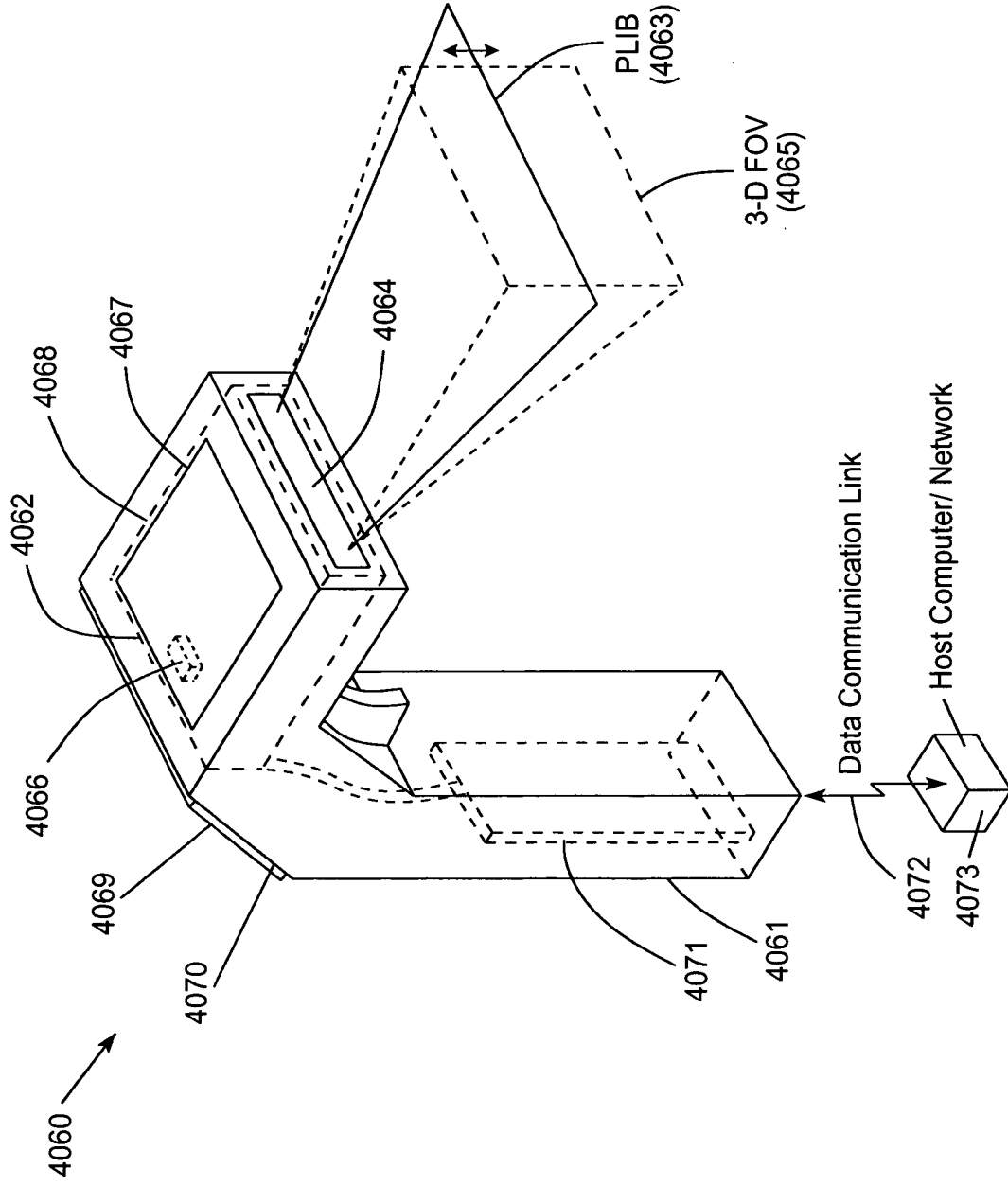
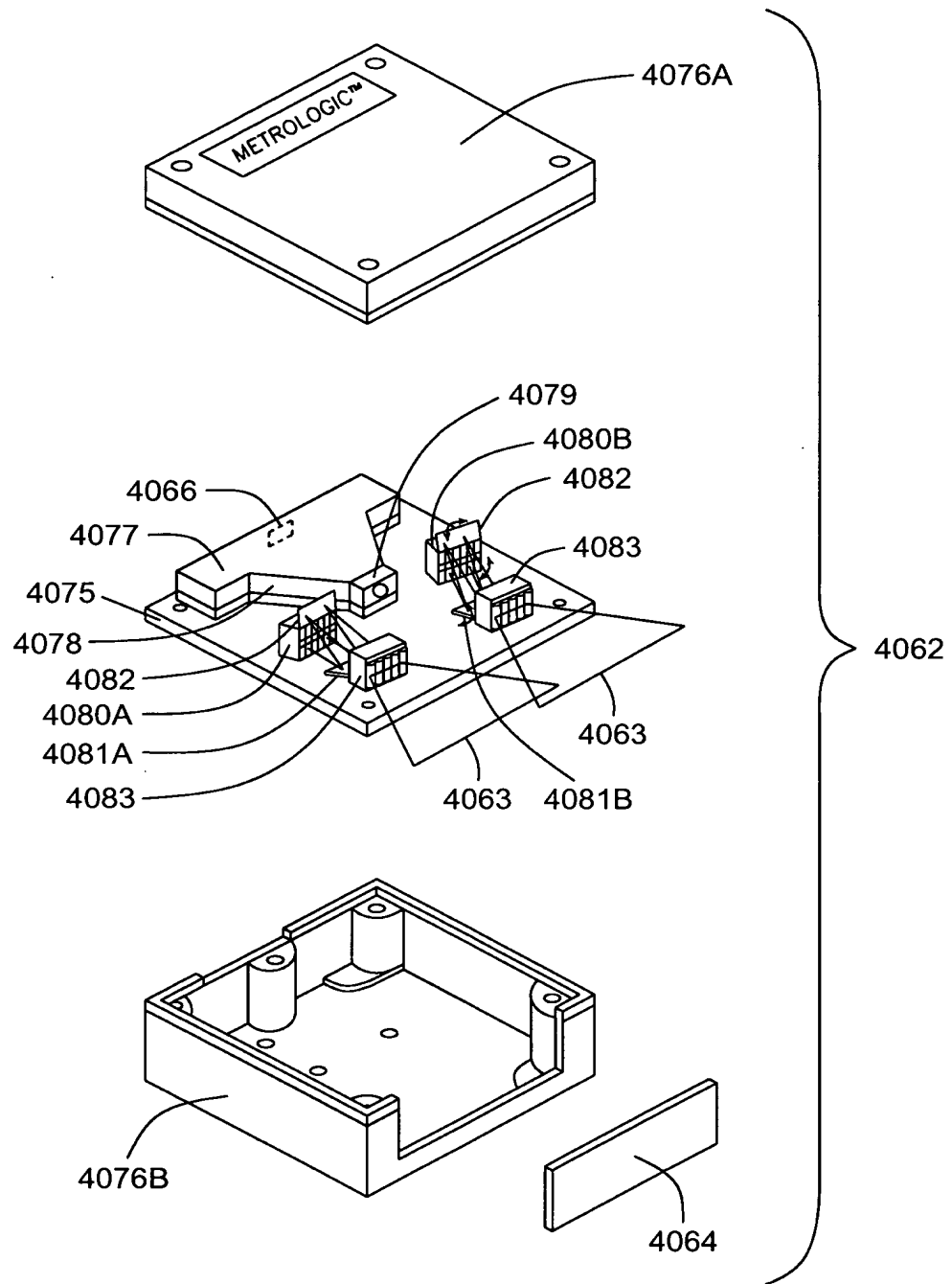


FIG. 54A



(Dual Mirrors)
Fig. 115A-5D

FIG. 54B

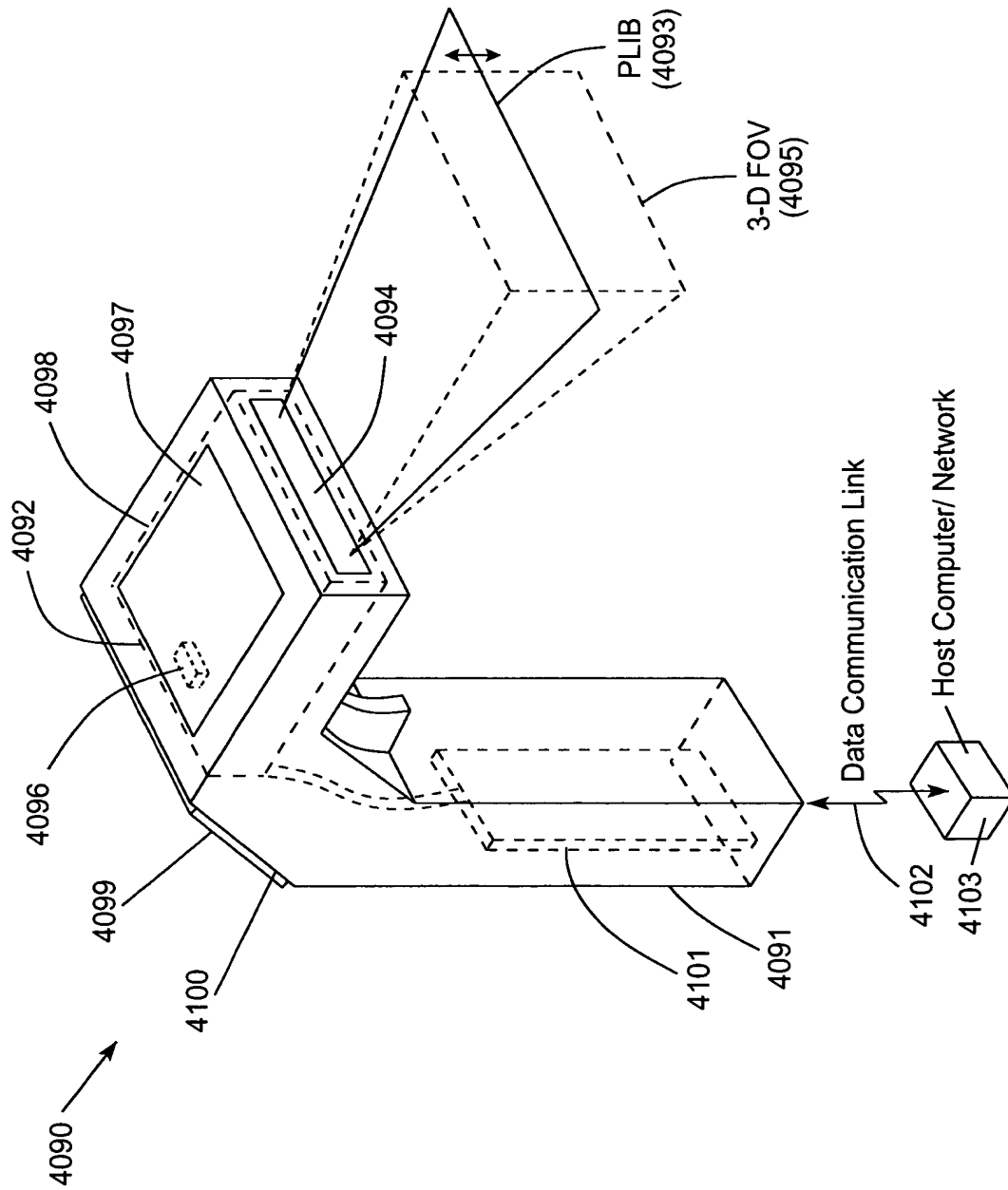
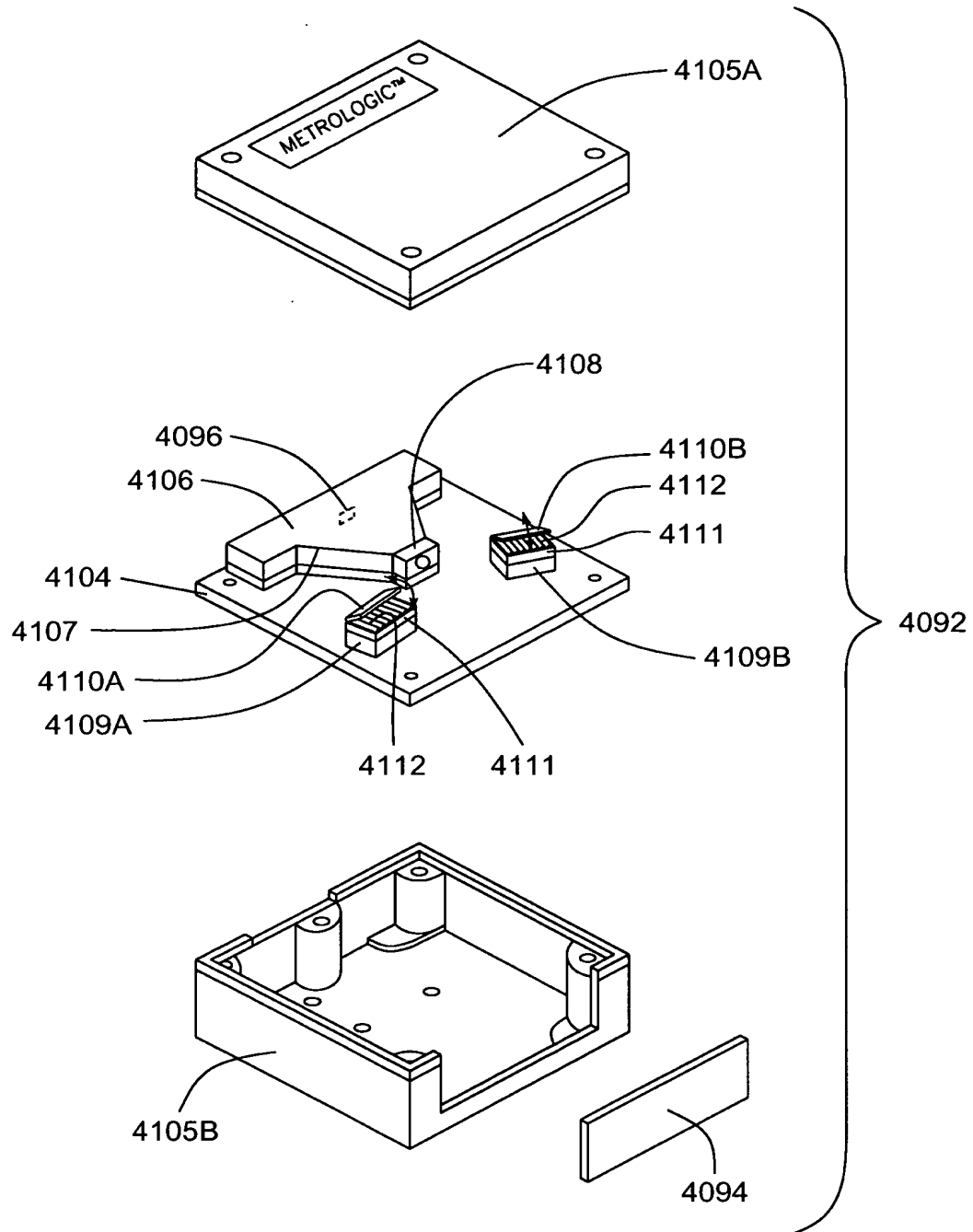


FIG. 55A



Bragg Cell
Fig. 116A-6B

FIG. 55B

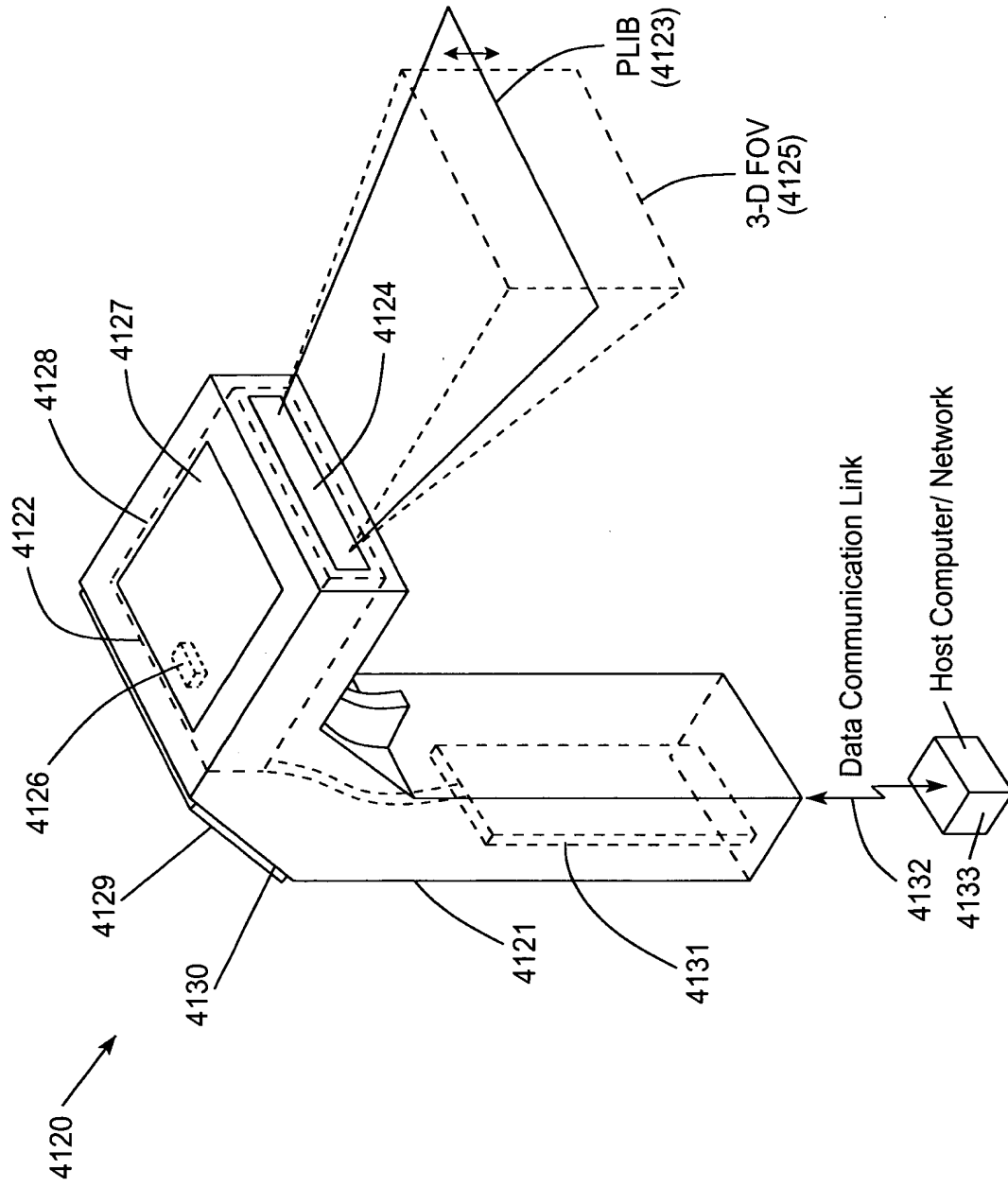
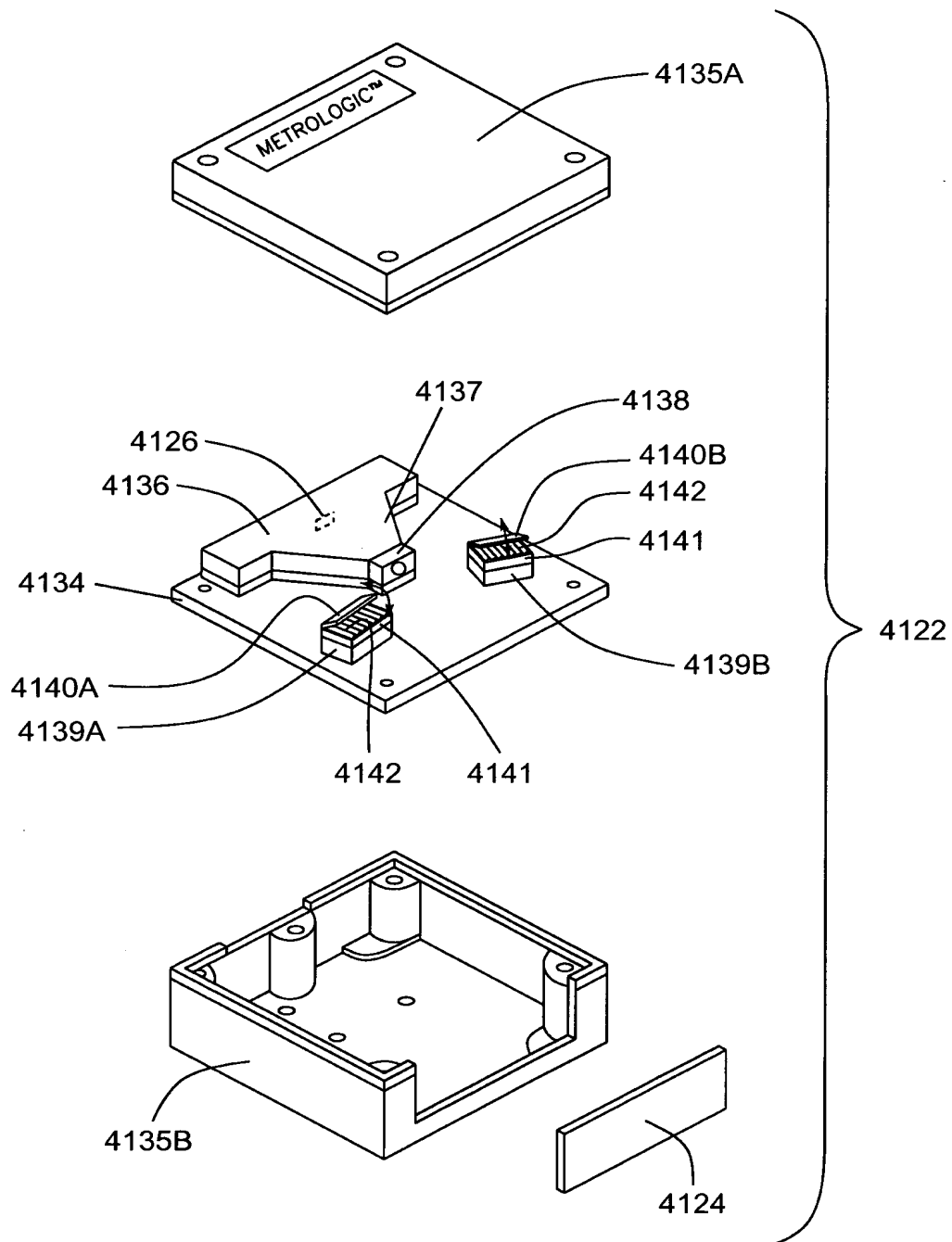


FIG. 56A



DM
Fig. 117A-7B

FIG. 56B

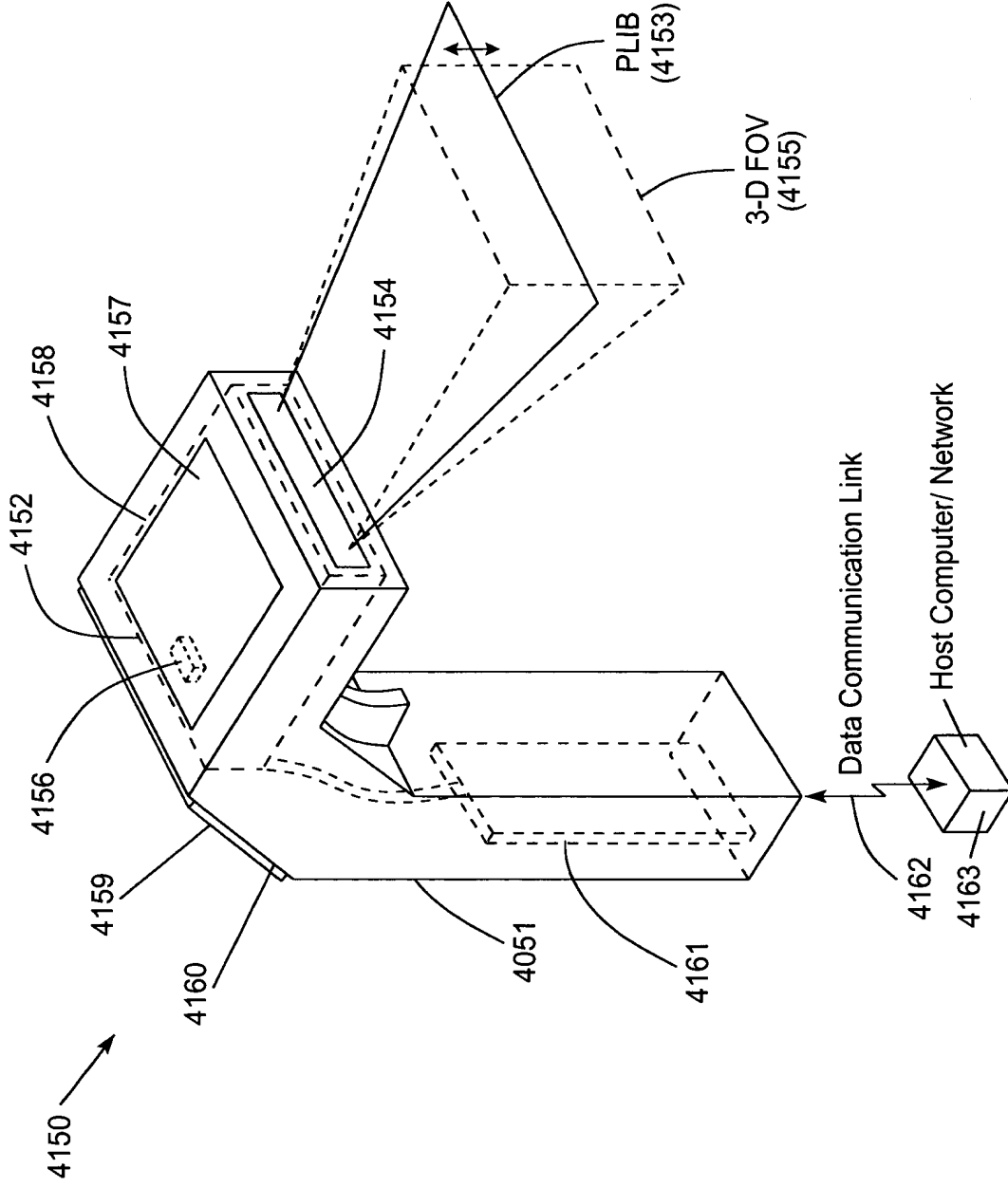
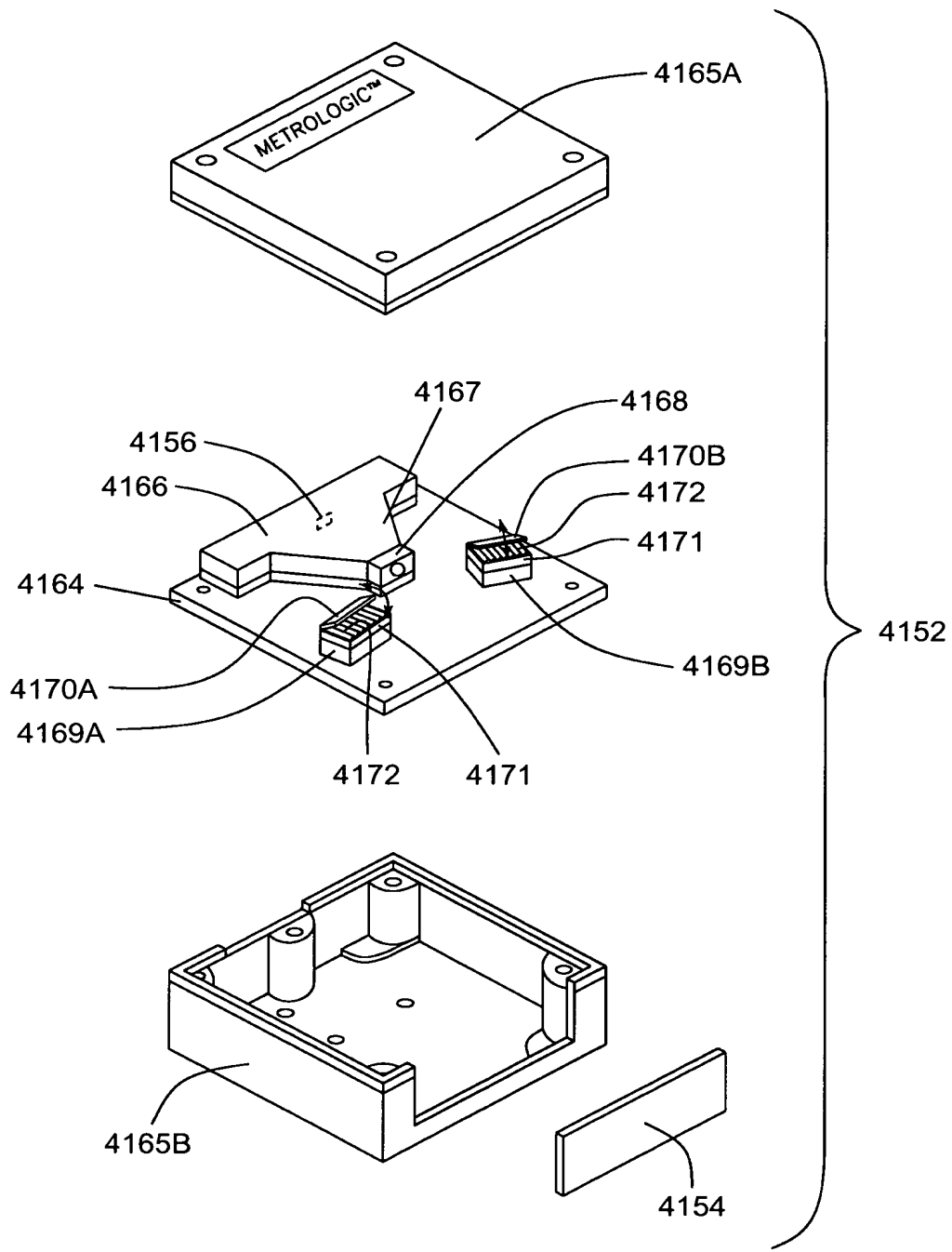


FIG. 57A



Phase Only LCD
PM Panel
Fig. 118F-8G

FIG. 57B

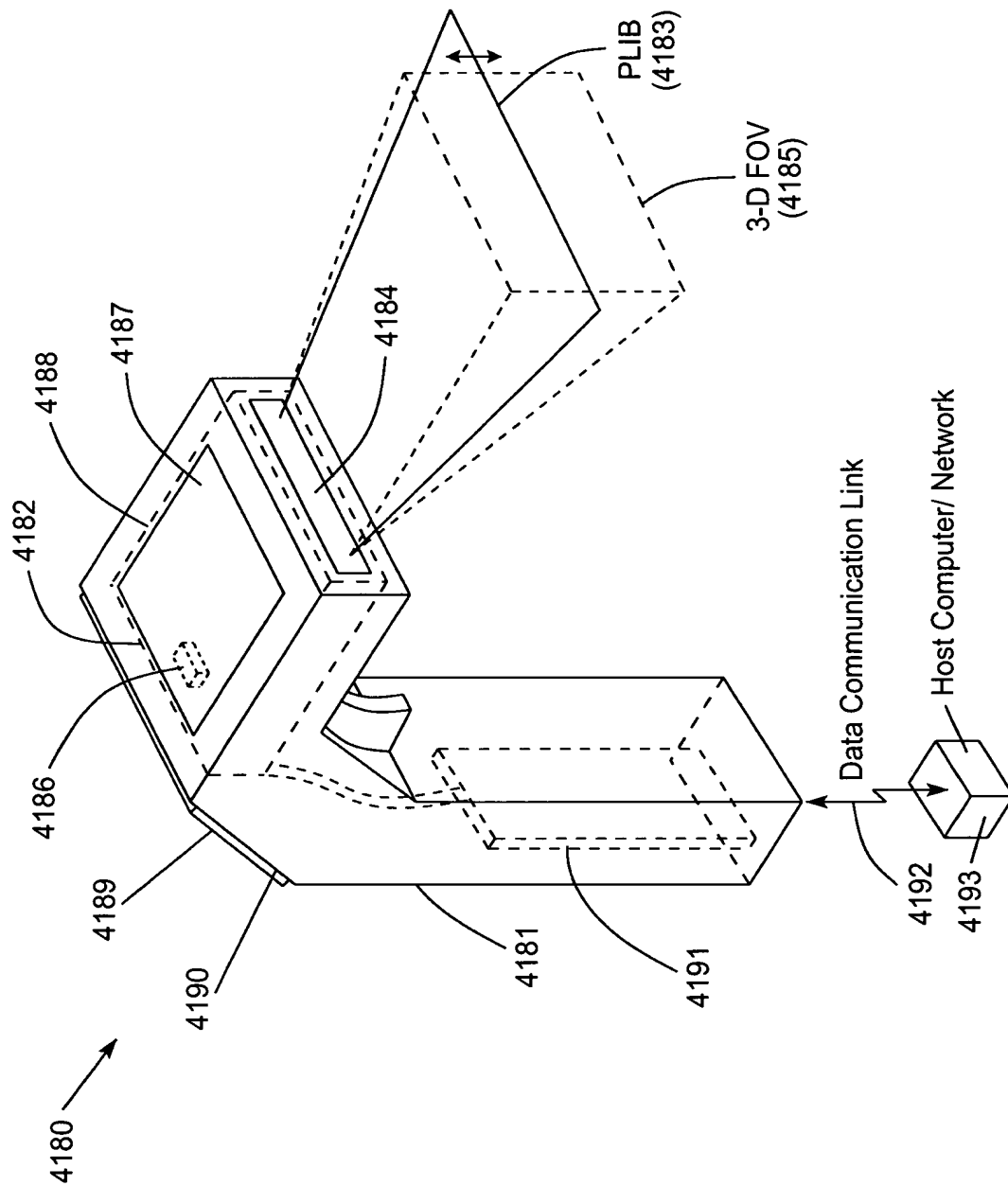
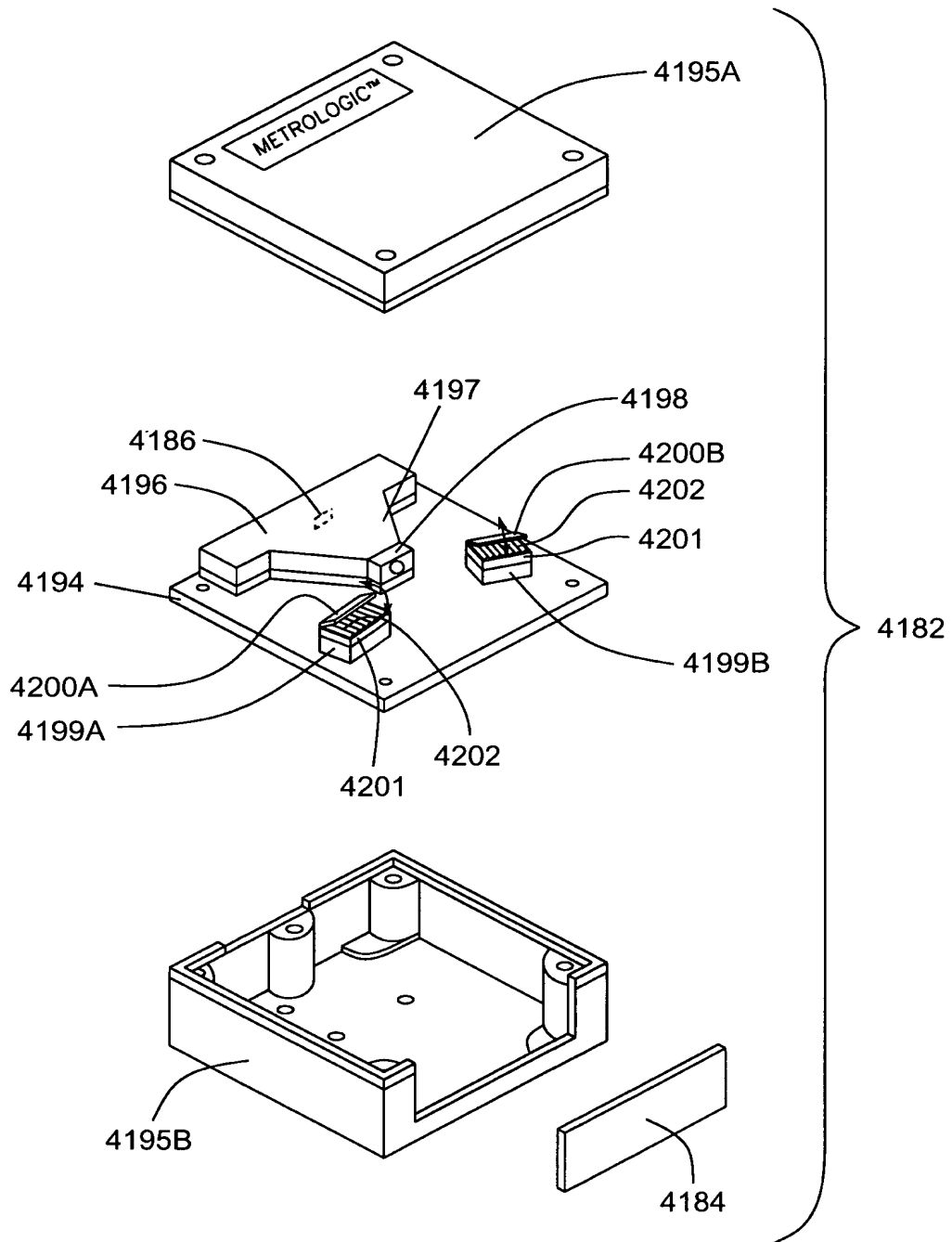


FIG. 58A



HS Optical Shutter
Fig. 1114A-14B

FIG. 58B

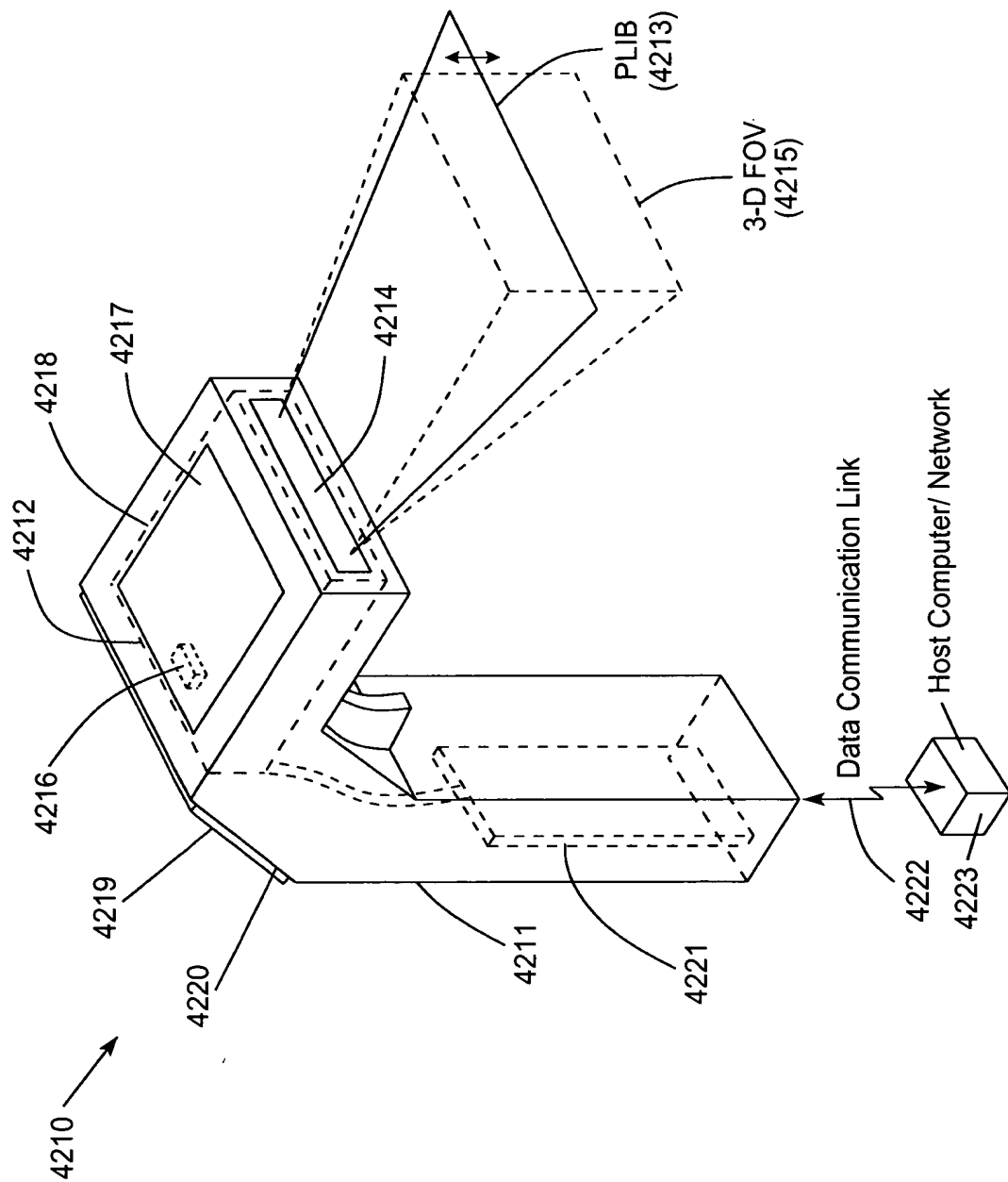
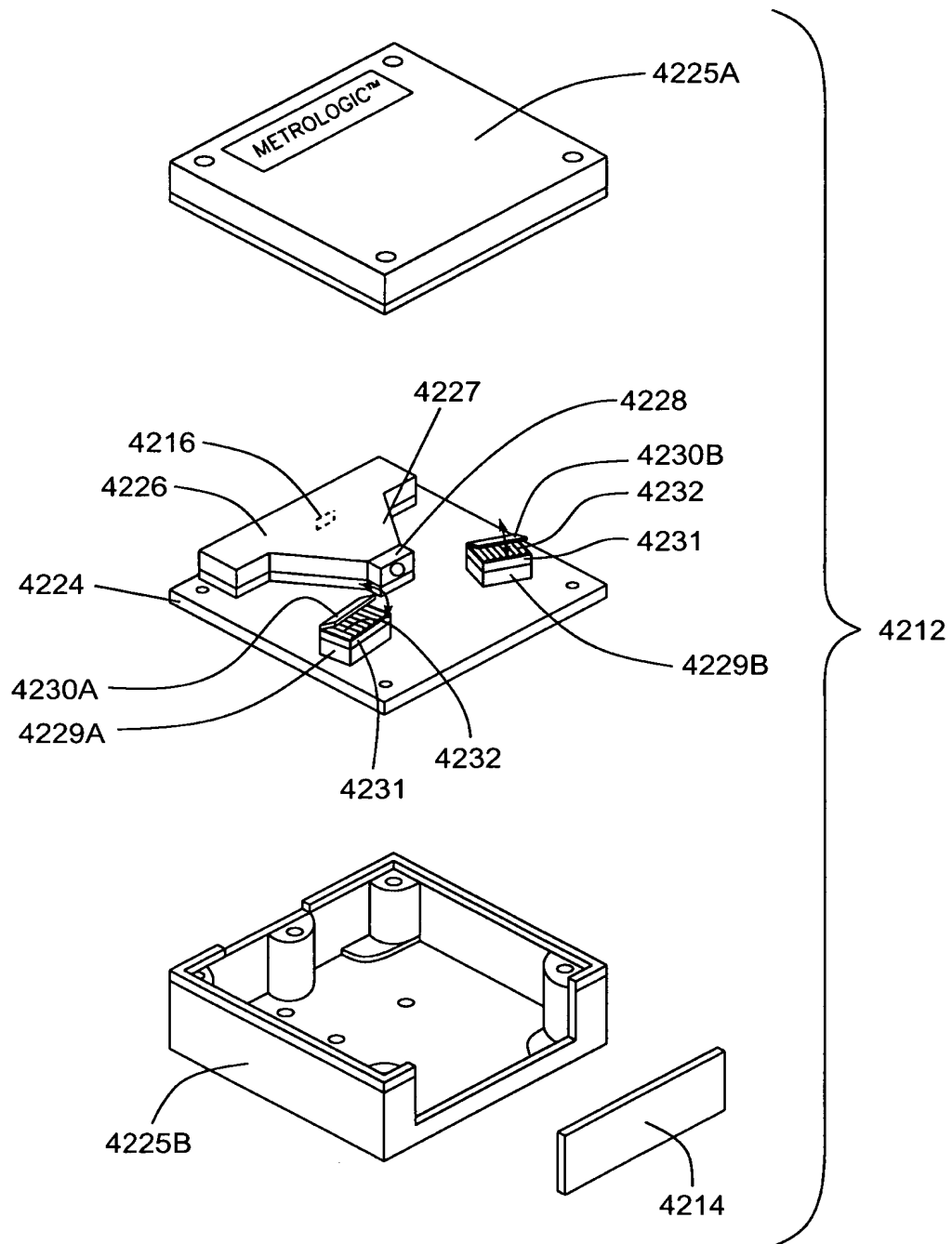


FIG. 59A



MLLD
Fig. 1115A-15B

FIG. 59B

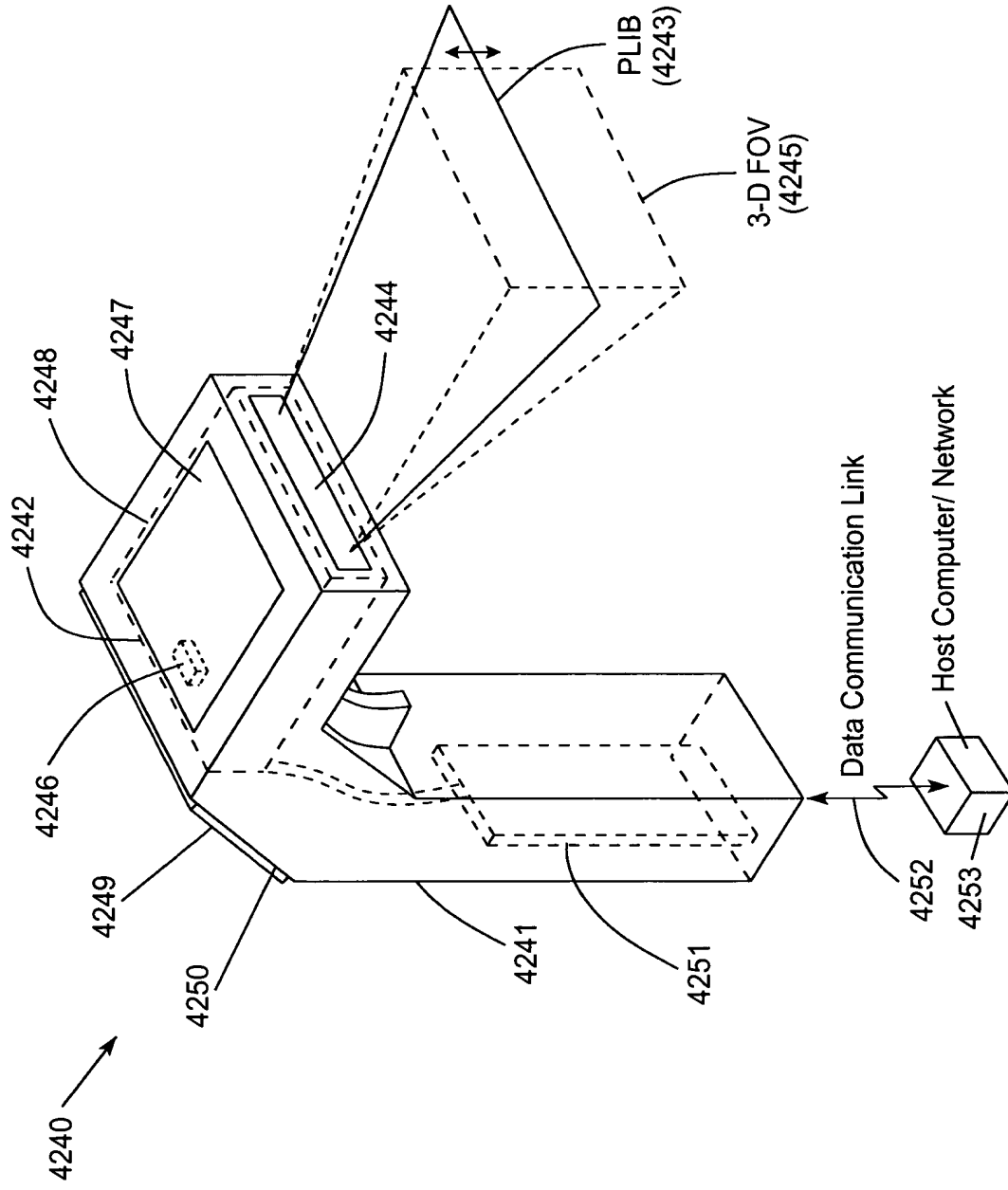
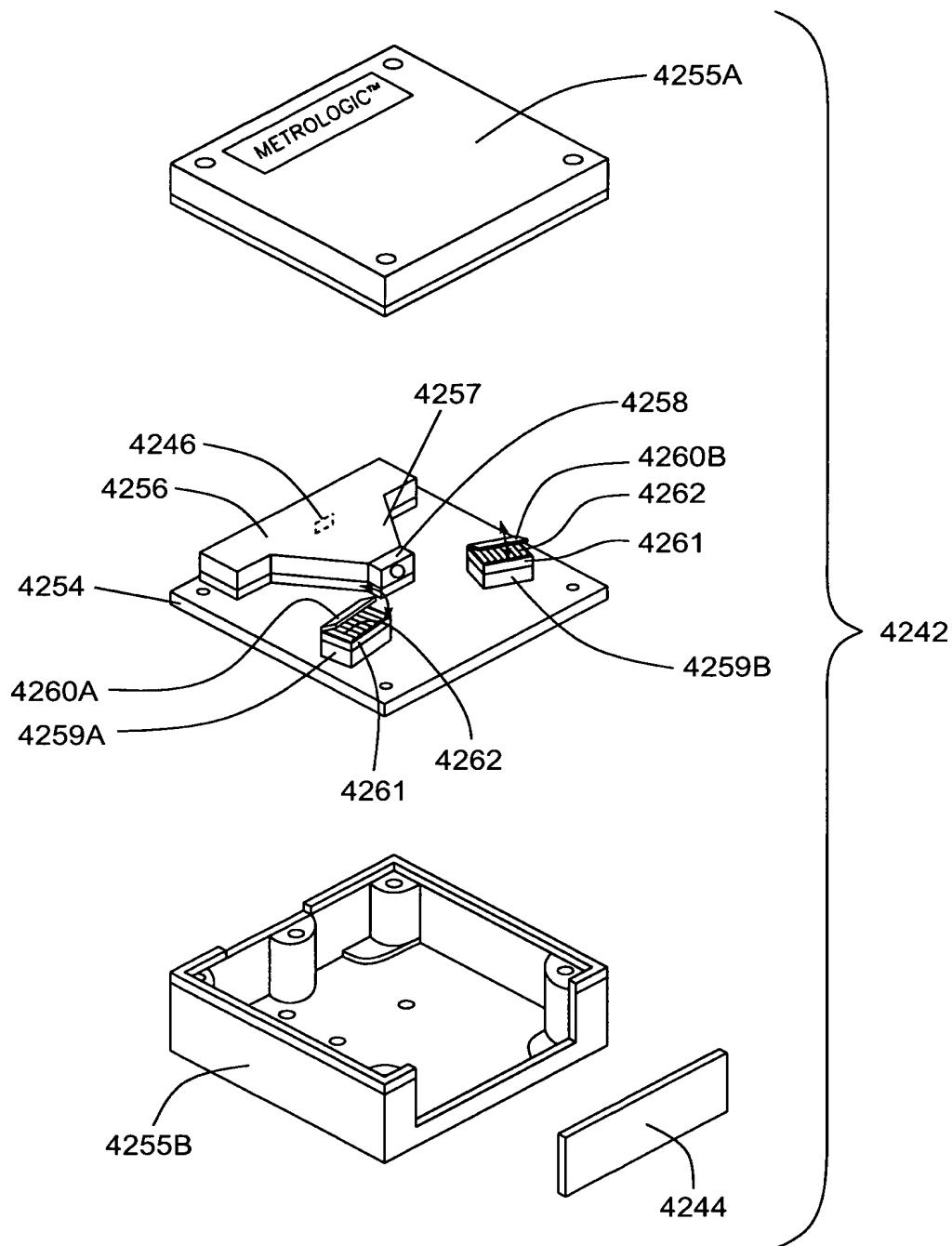


FIG. 60A



Etalon (Temp. Phase Mod.)
Fig. 1117A-17B

FIG. 60B

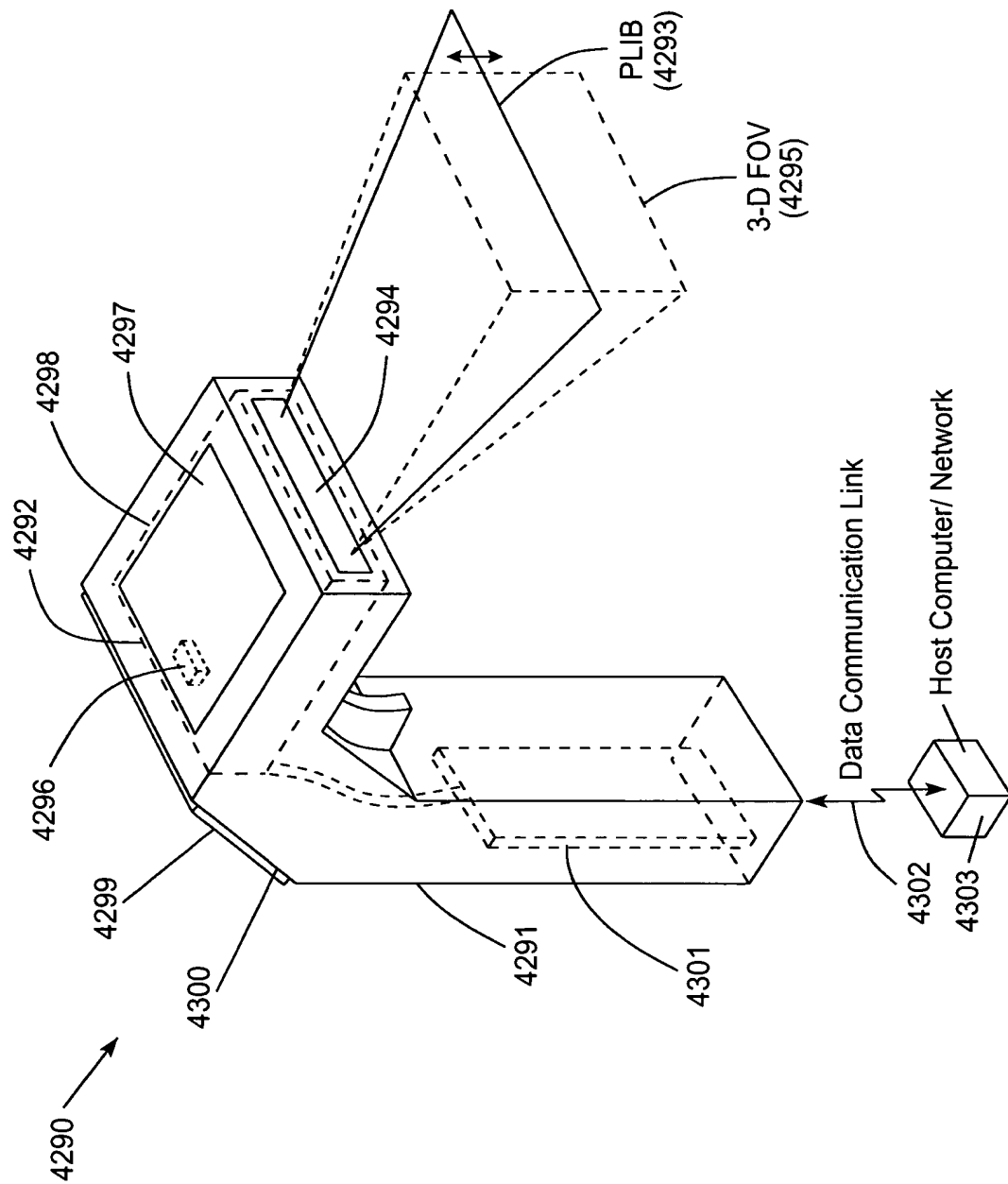
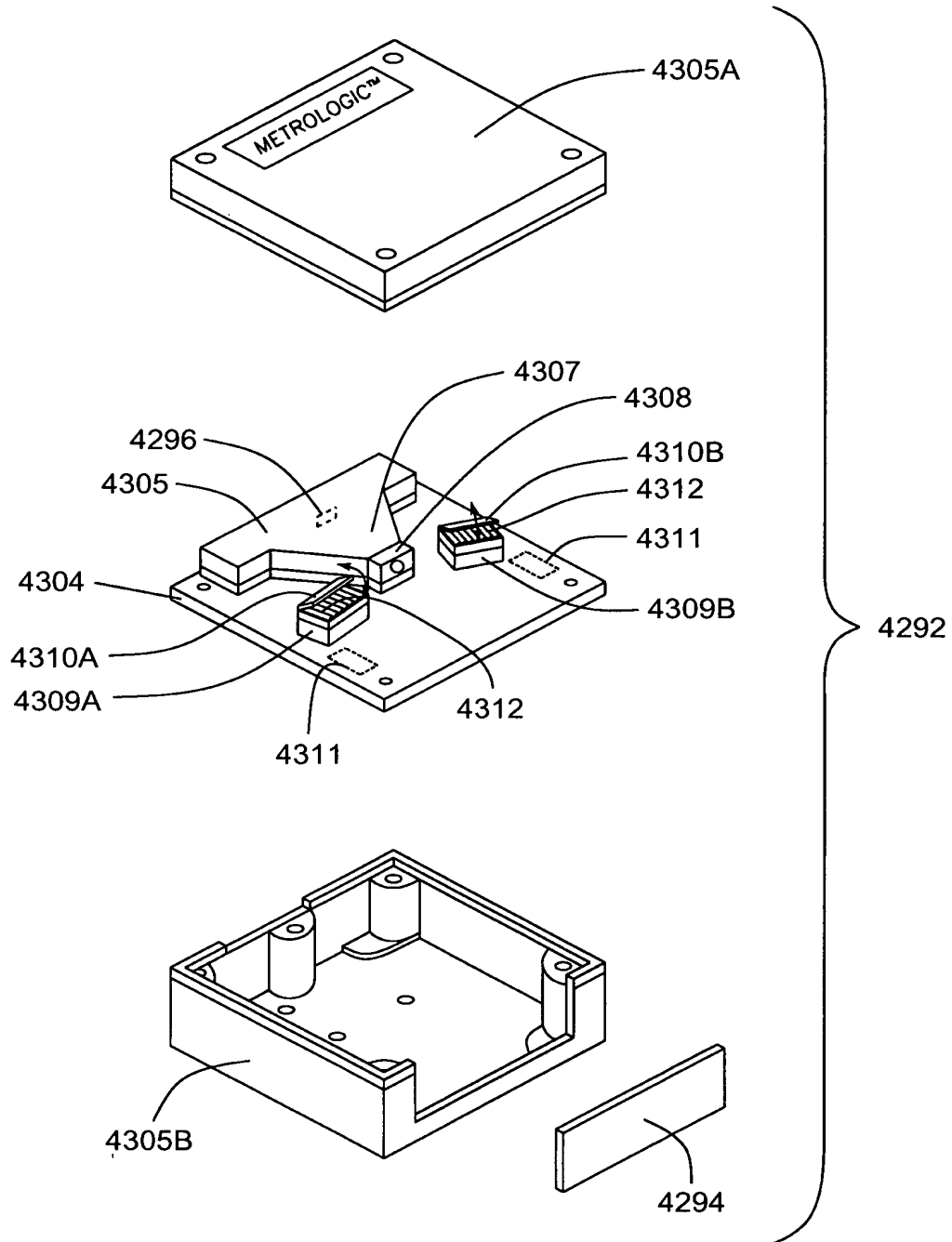


FIG. 61A



Mode Hopping
Fig. 1119A-19B

FIG. 61B

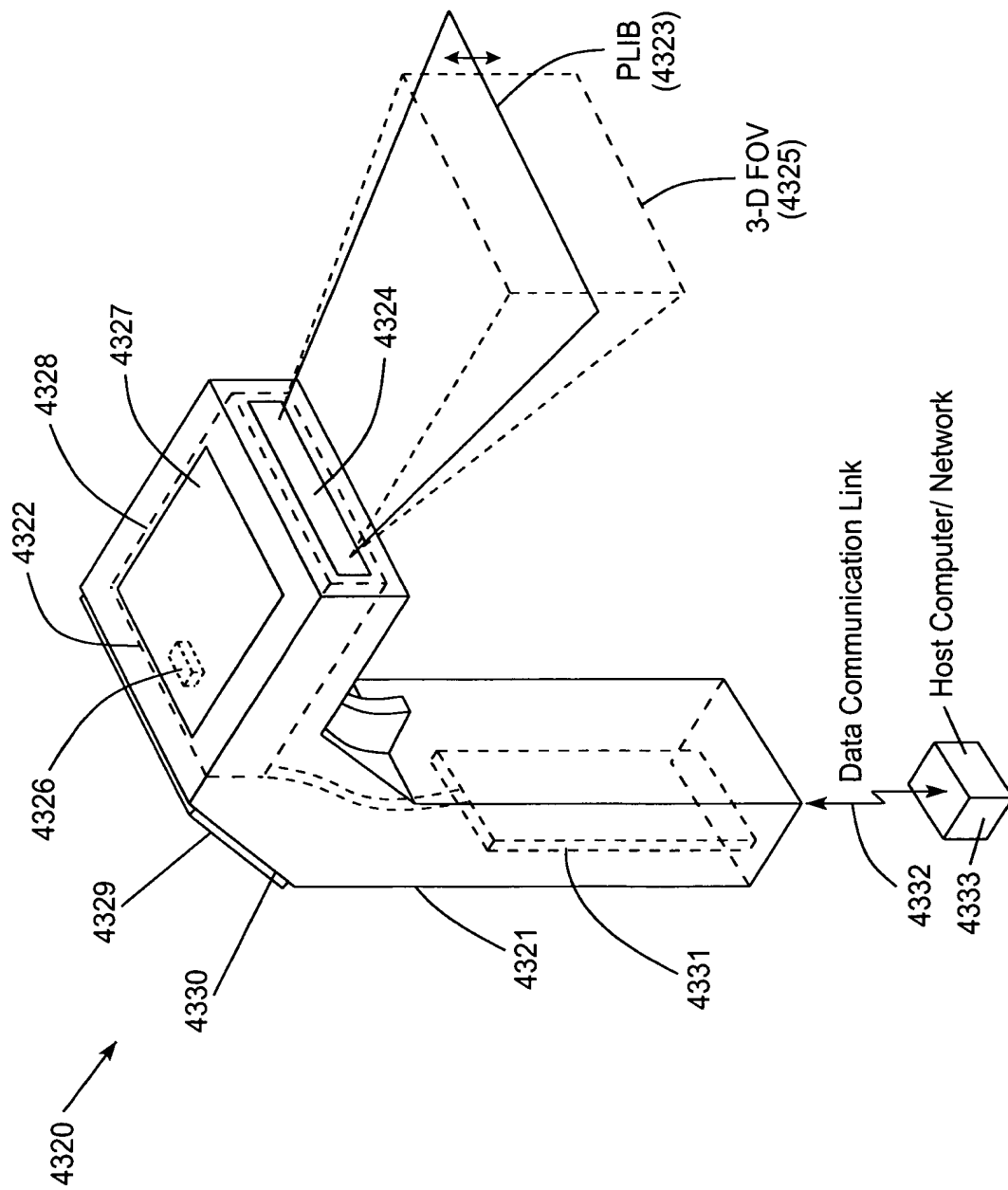
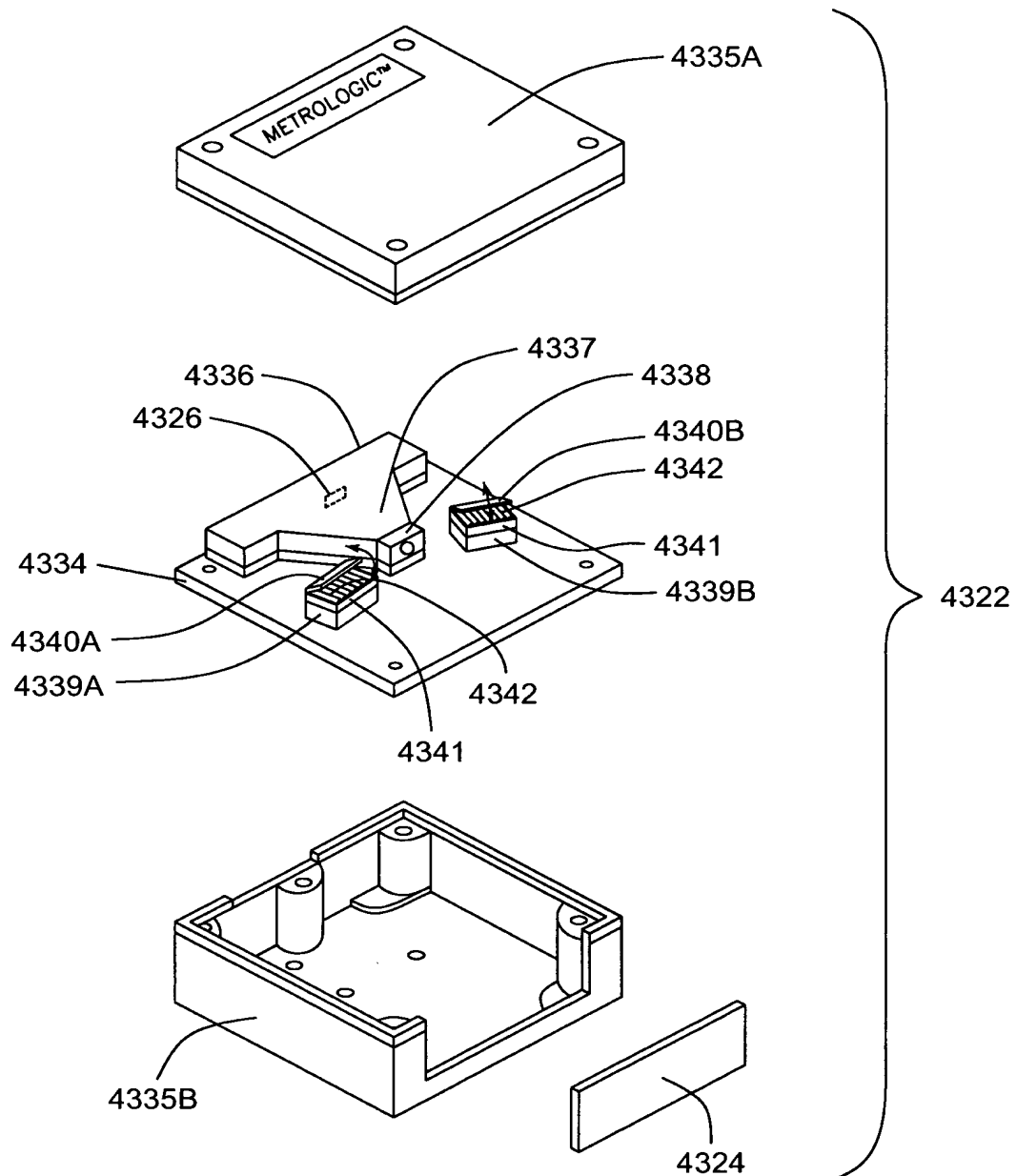


FIG. 62A



Micro-oscillating
 Spatial Intensity
 Modulation Panels
 Fig. 1121A-21D

FIG. 62B

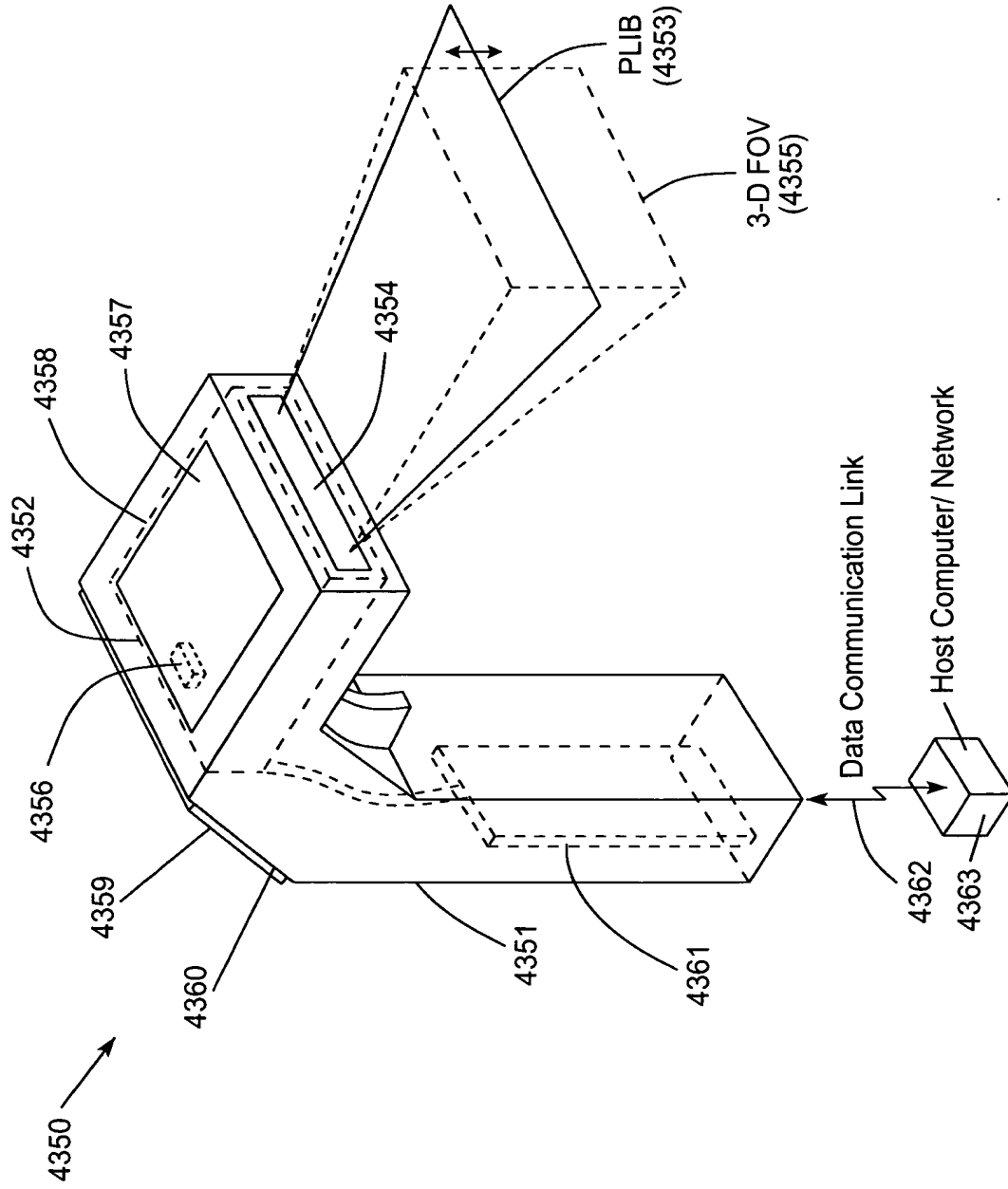
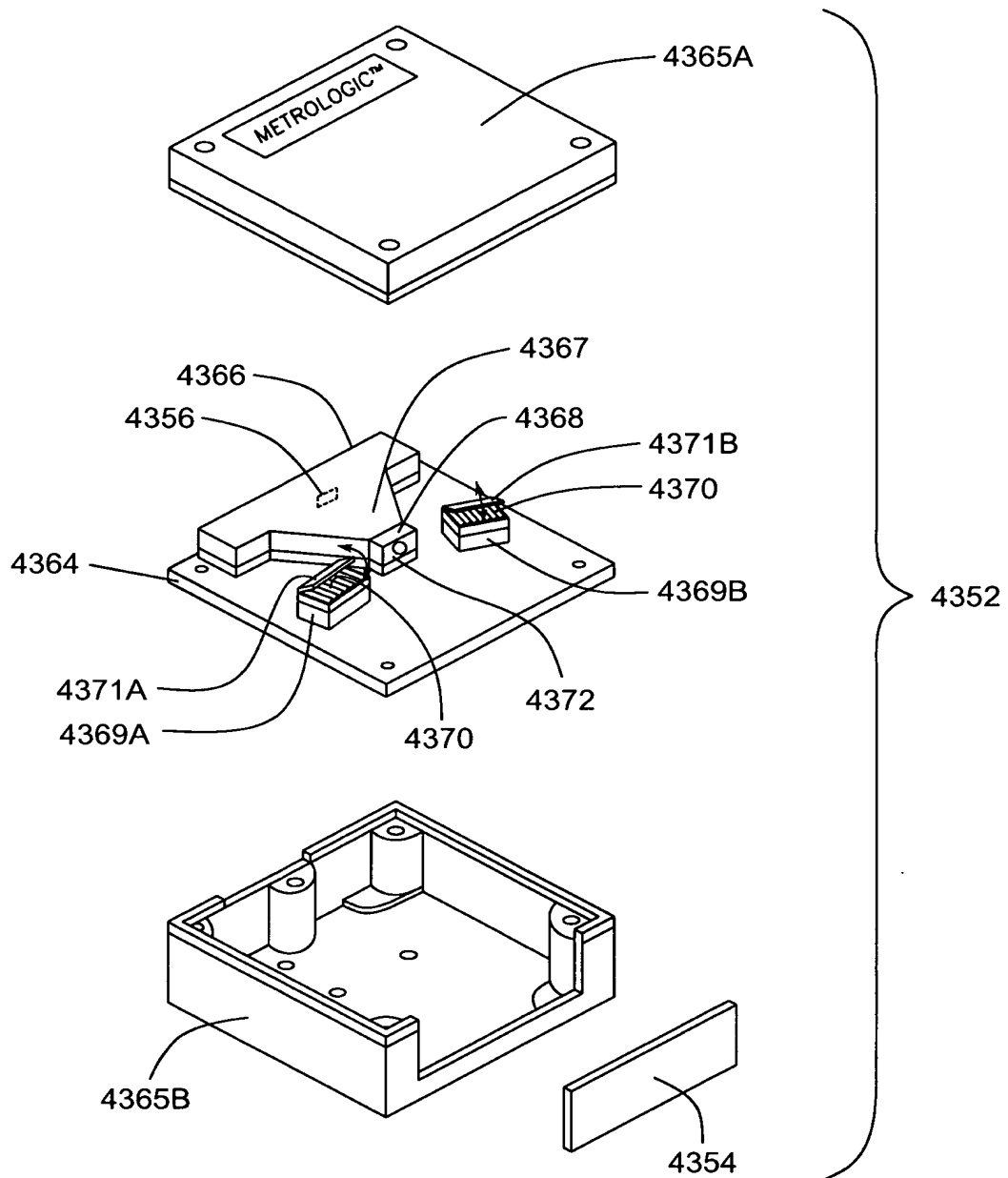


FIG. 63A



EO or Mechanically
Rotating Iris

Fig. 1123A-23B

FIG. 63B

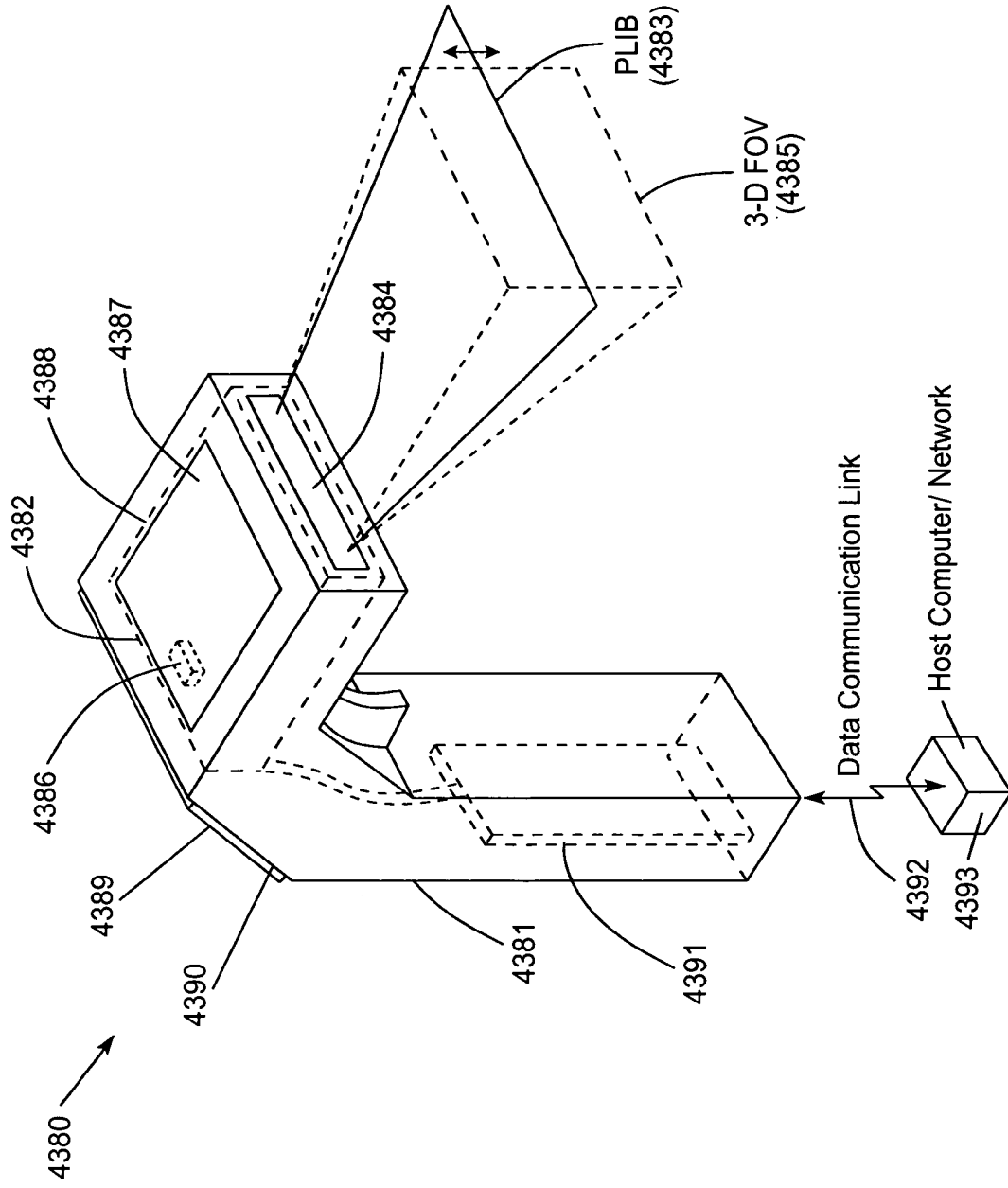
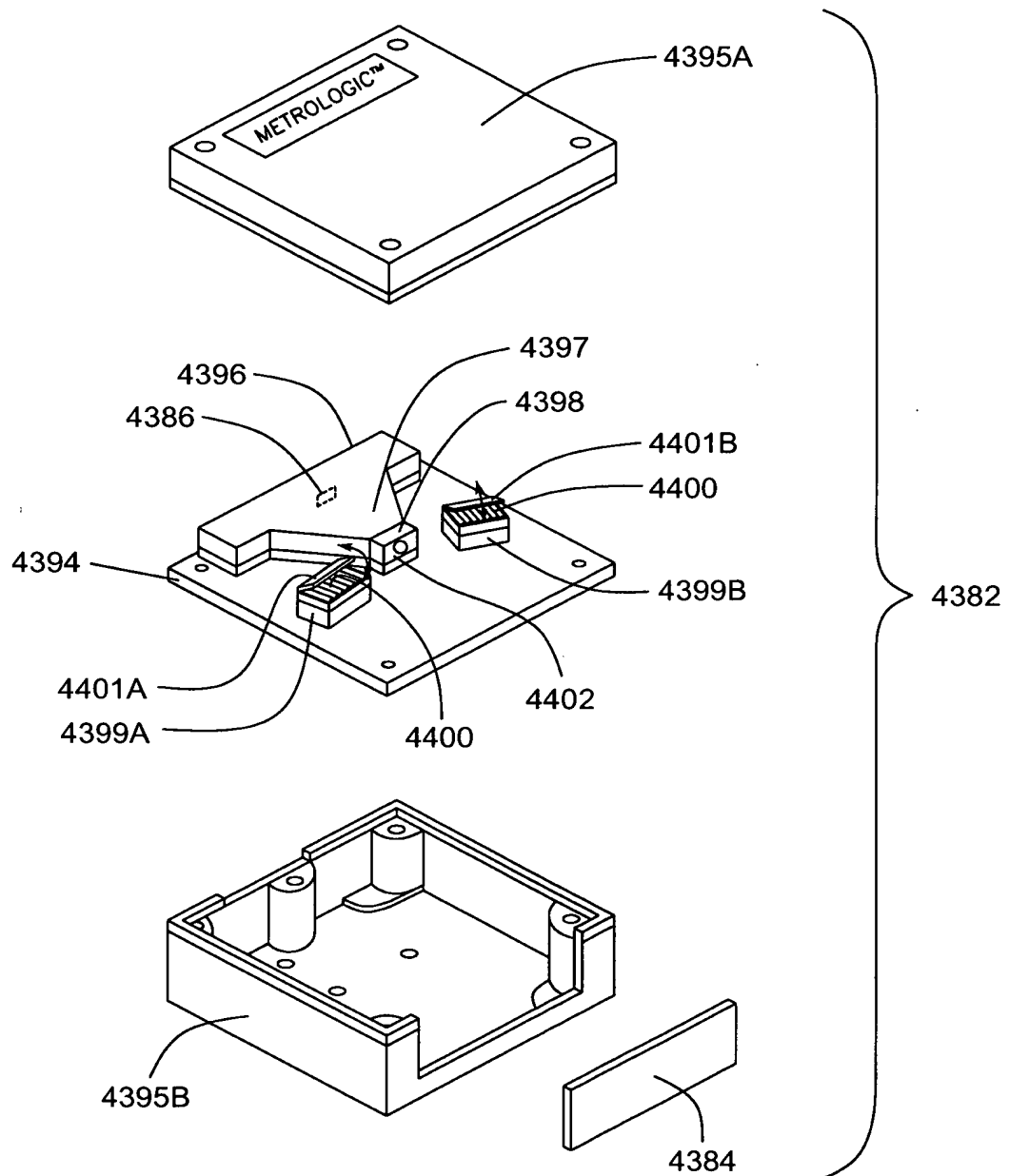


FIG. 64A



E-optical Shutter
Before IFD Lens

Fig. 1124A

FIG. 64B

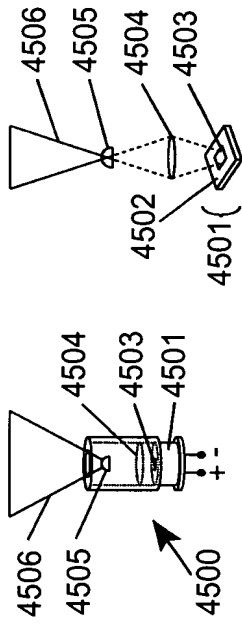


FIG. 65A

FIG. 65B

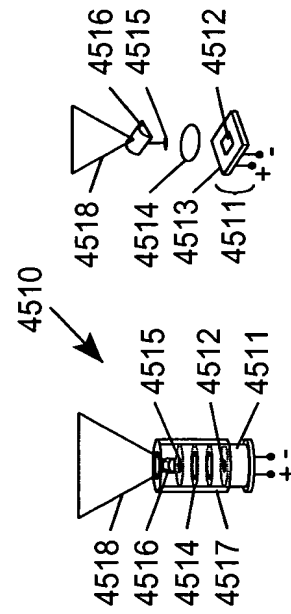


FIG. 66A

FIG. 66B

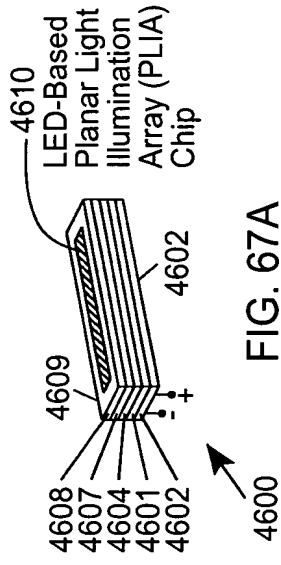


FIG. 67A

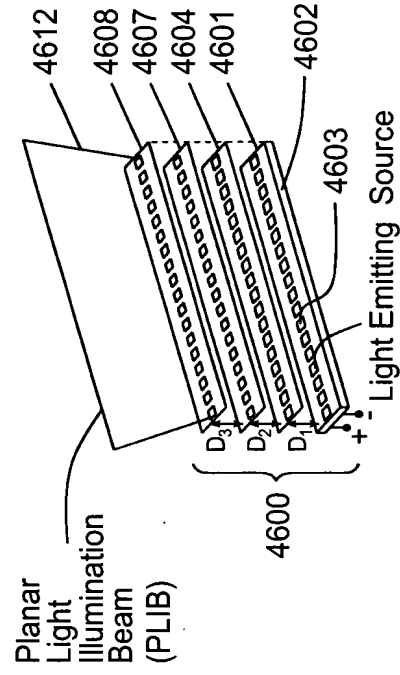


FIG. 67B

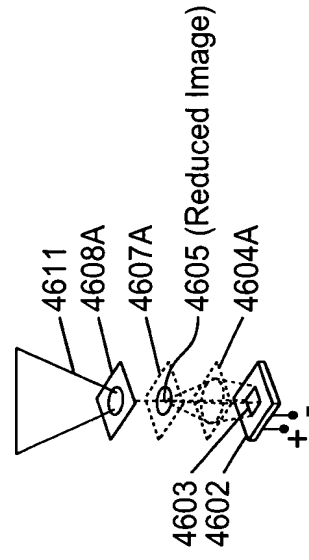


FIG. 67C

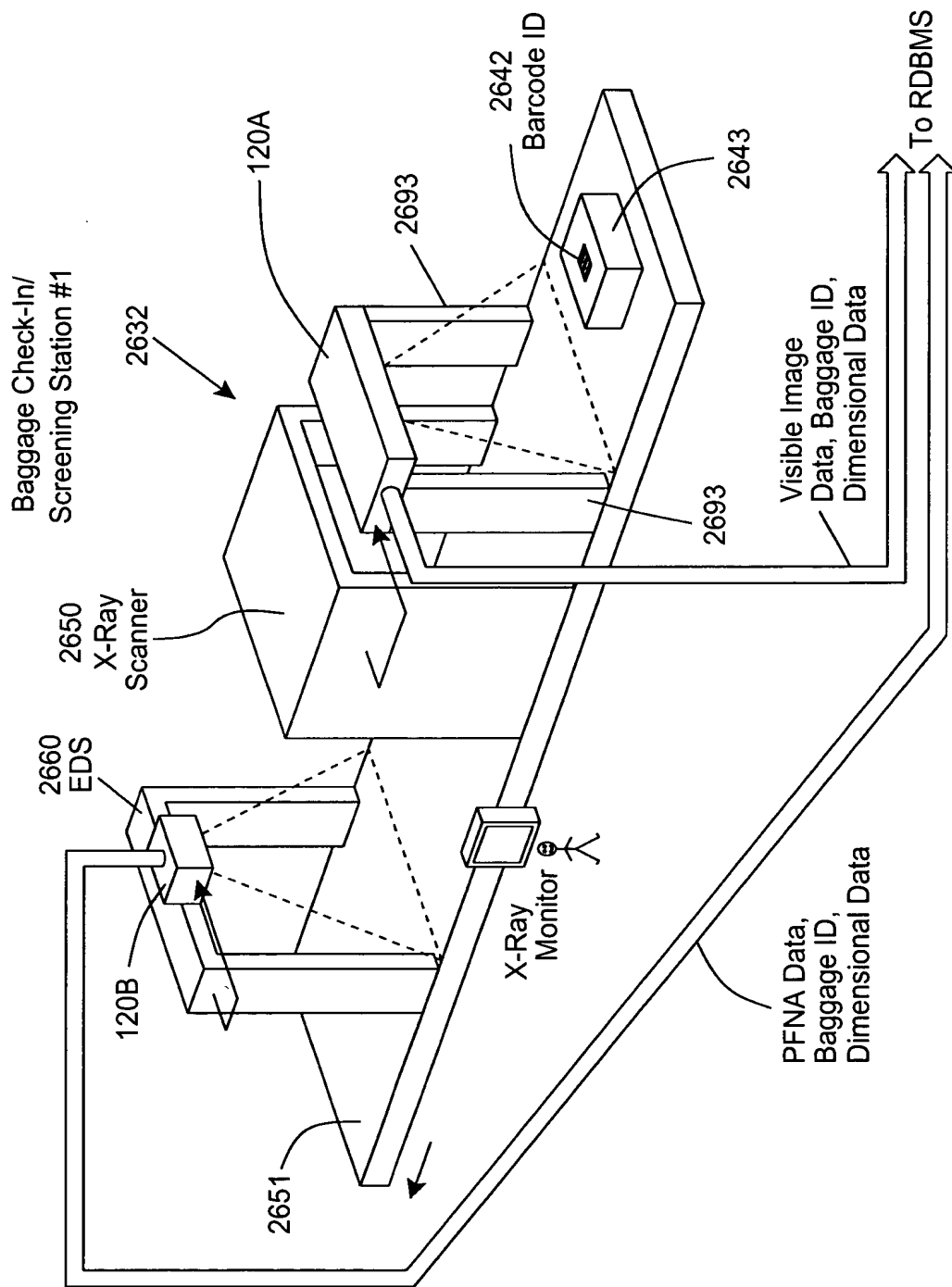
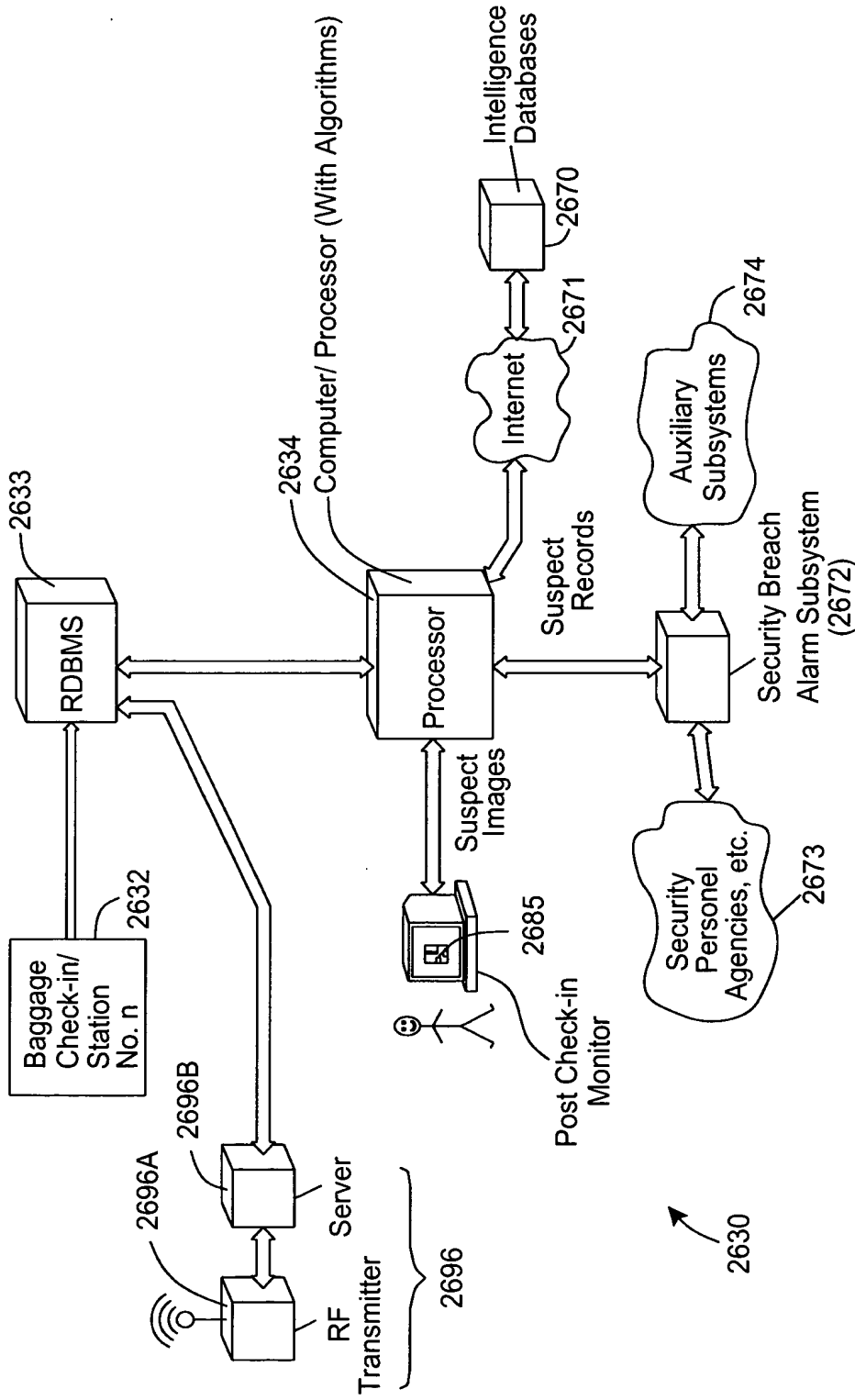


FIG. 68-1



"Airport Security System"

FIG. 68-2

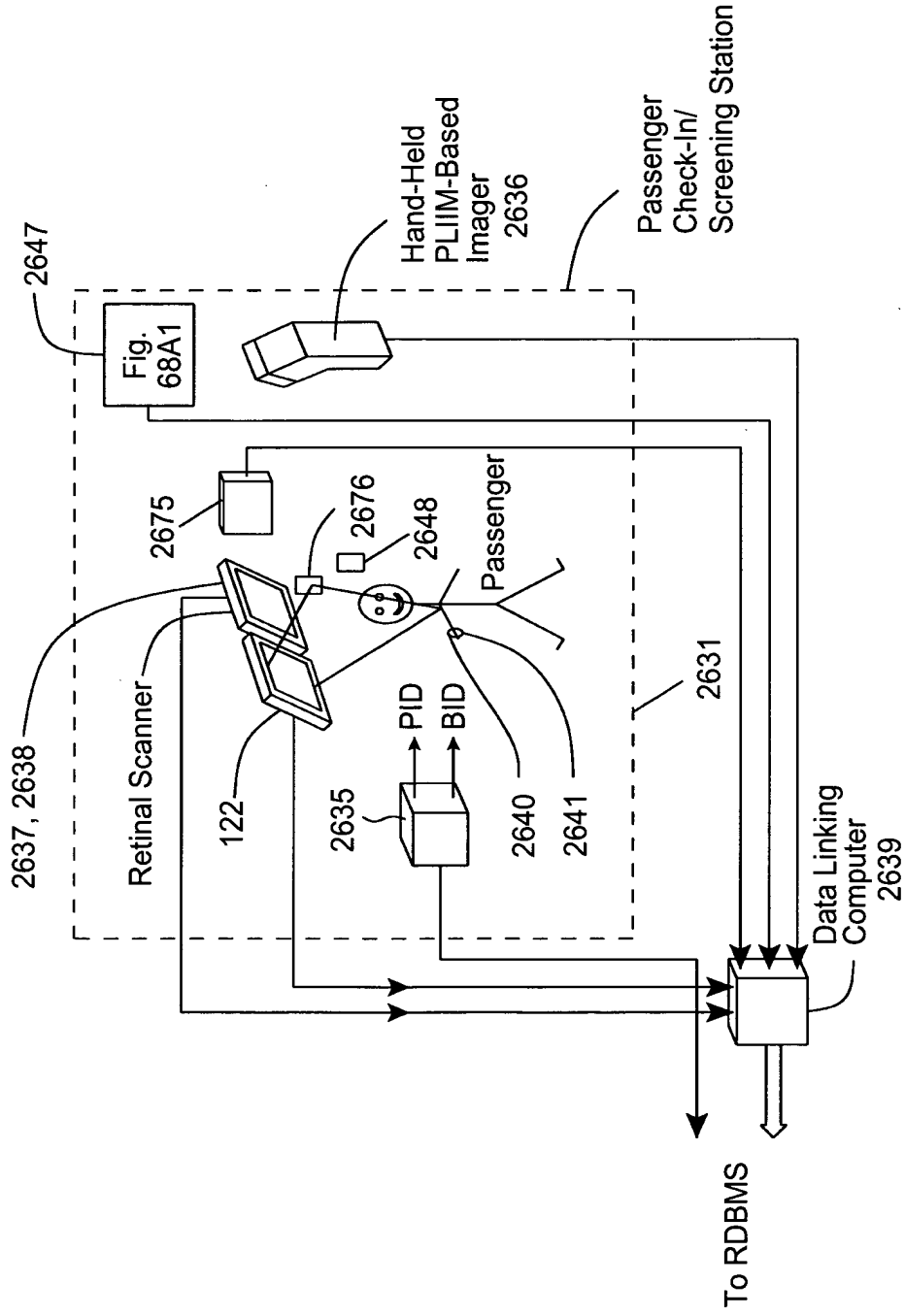


FIG. 68-3

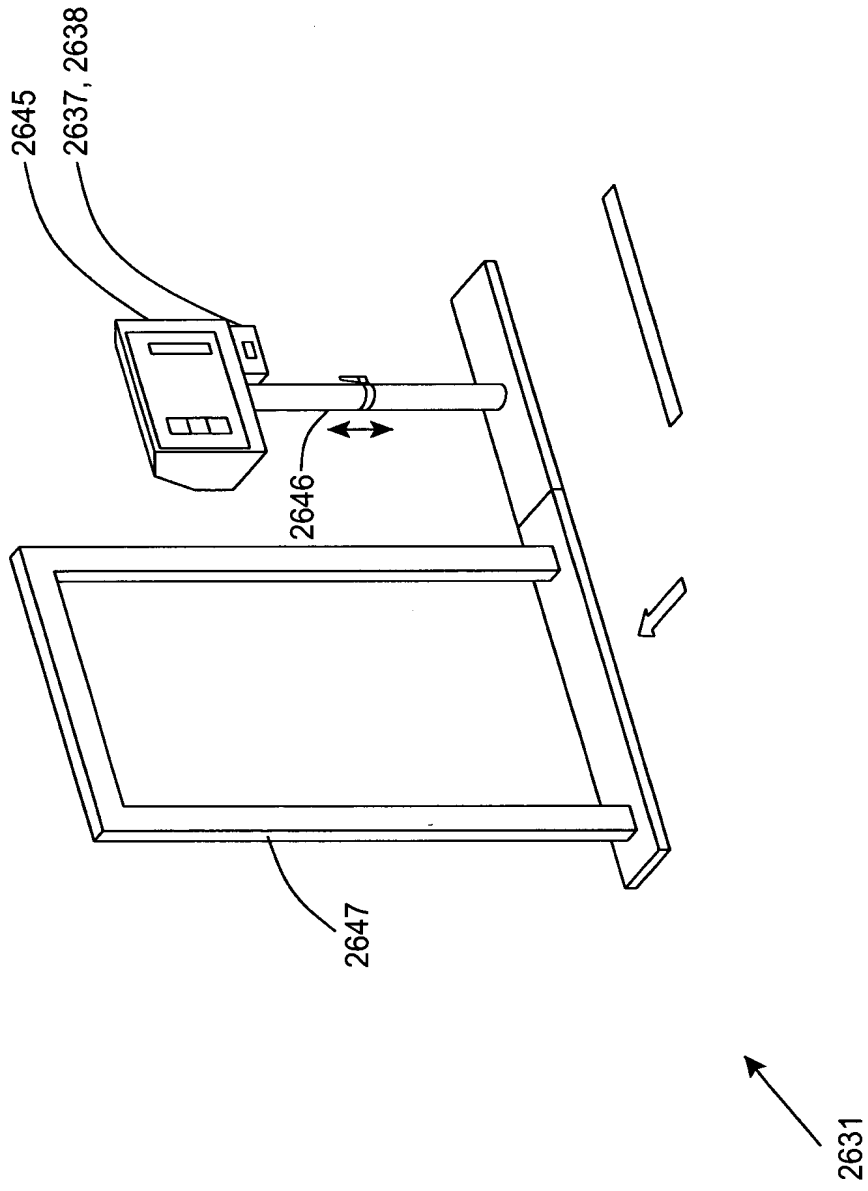
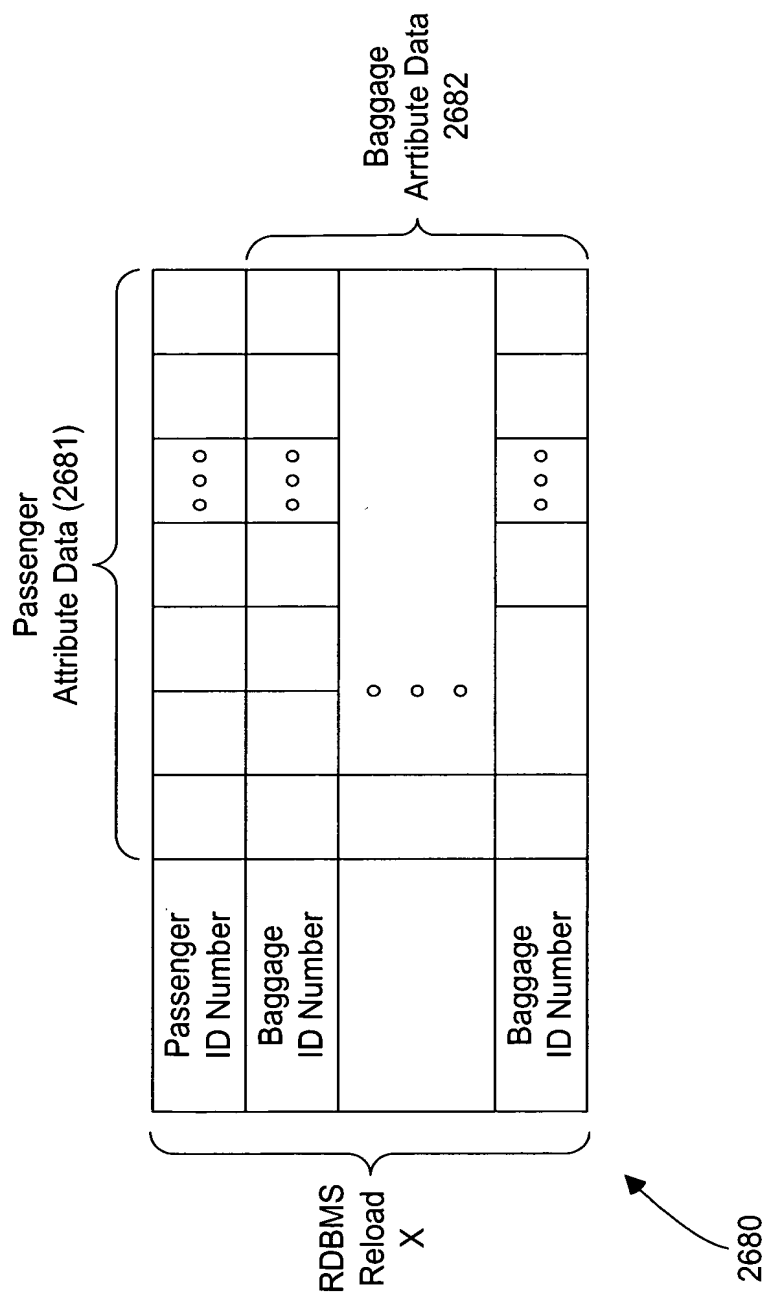


FIG. 68A



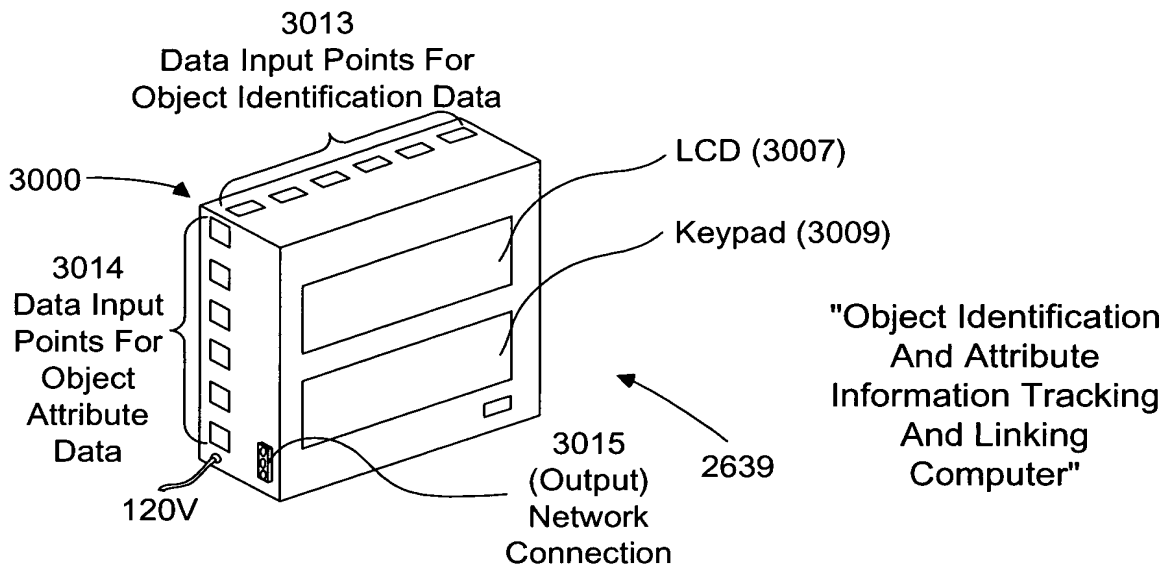


FIG. 68C1

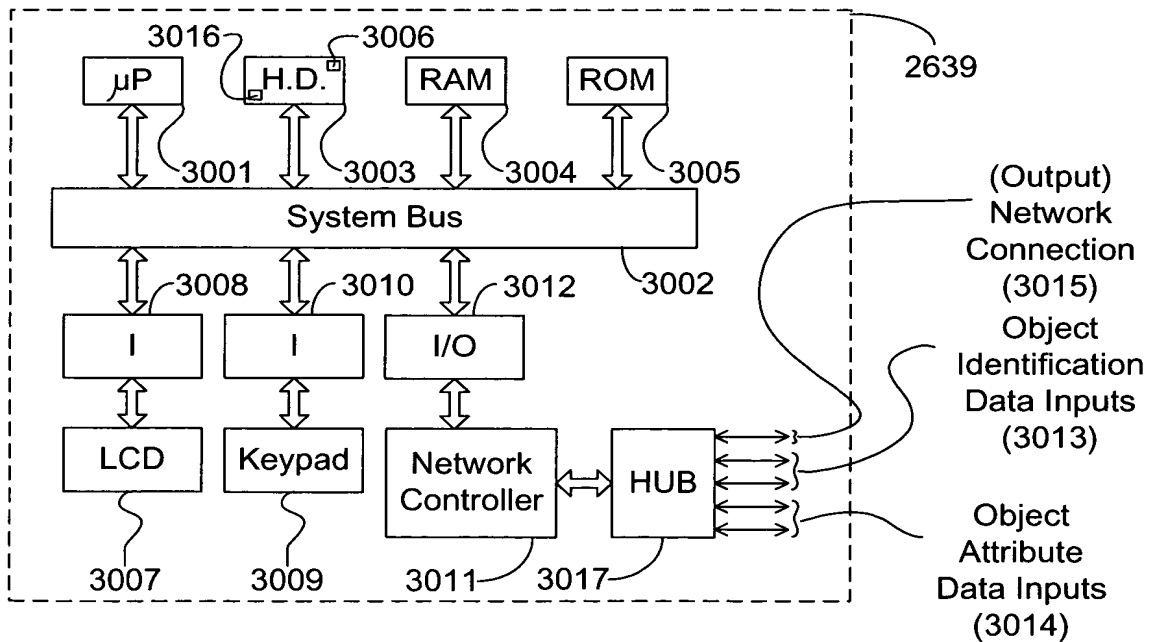


FIG. 68C2

Object Identification And Attribute Information Tracking And Linking Computer System

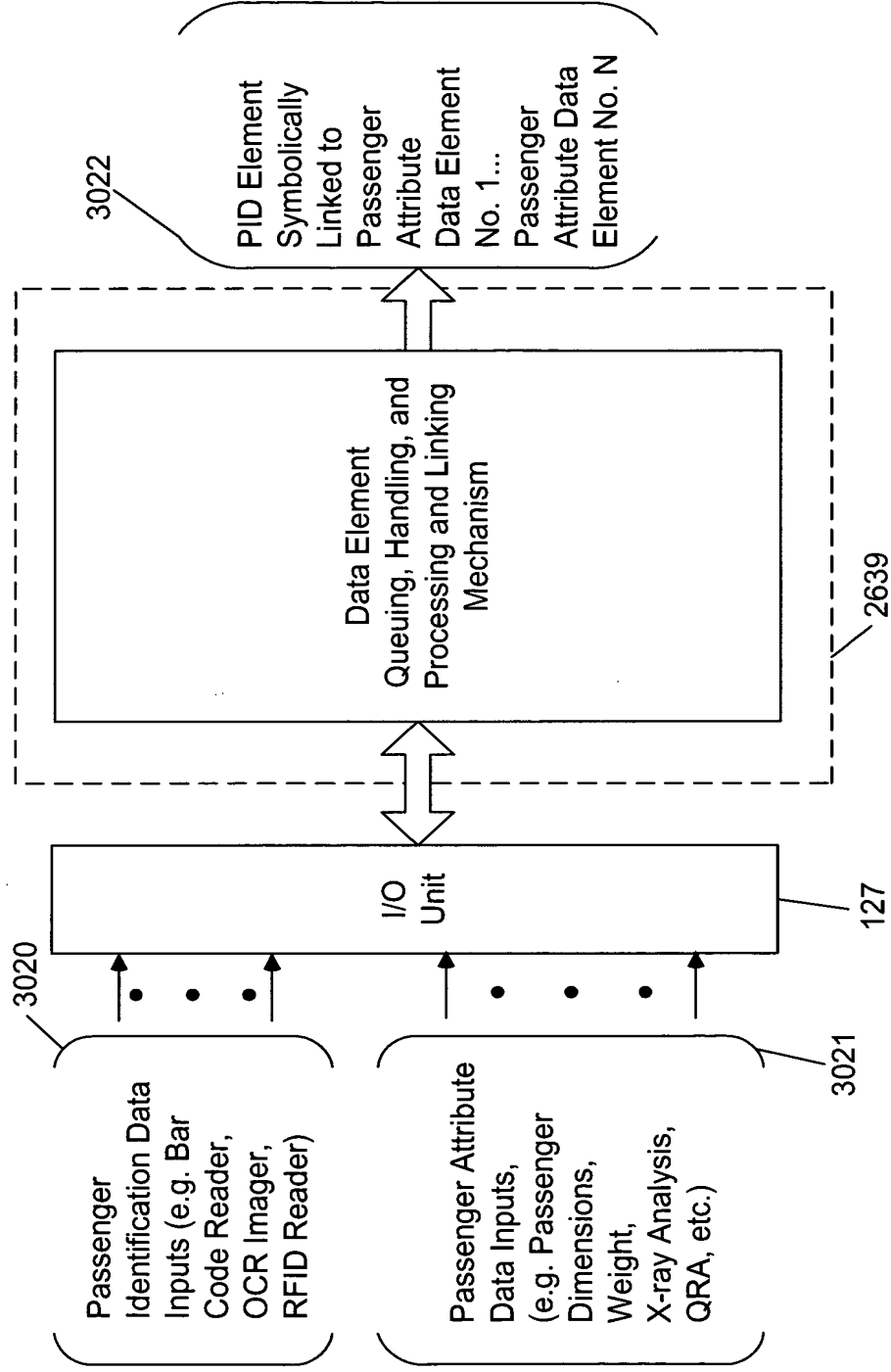


FIG. 68C3

Data Element Queuing, Handling, And Processing Subsystem Employed In The Object Identification
And Attribute Acquisition System Of The Present Invention. (131)

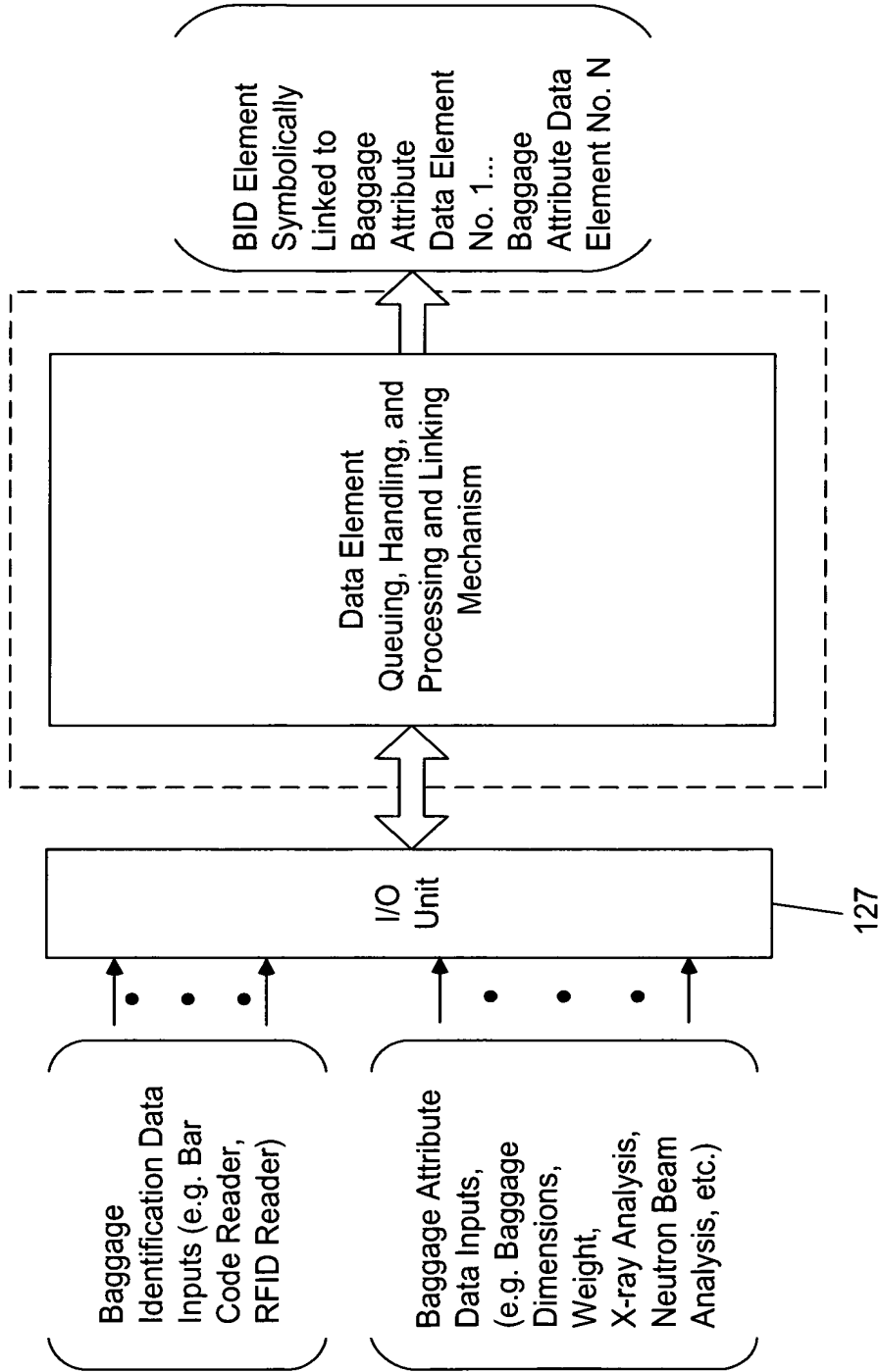


FIG. 68C4

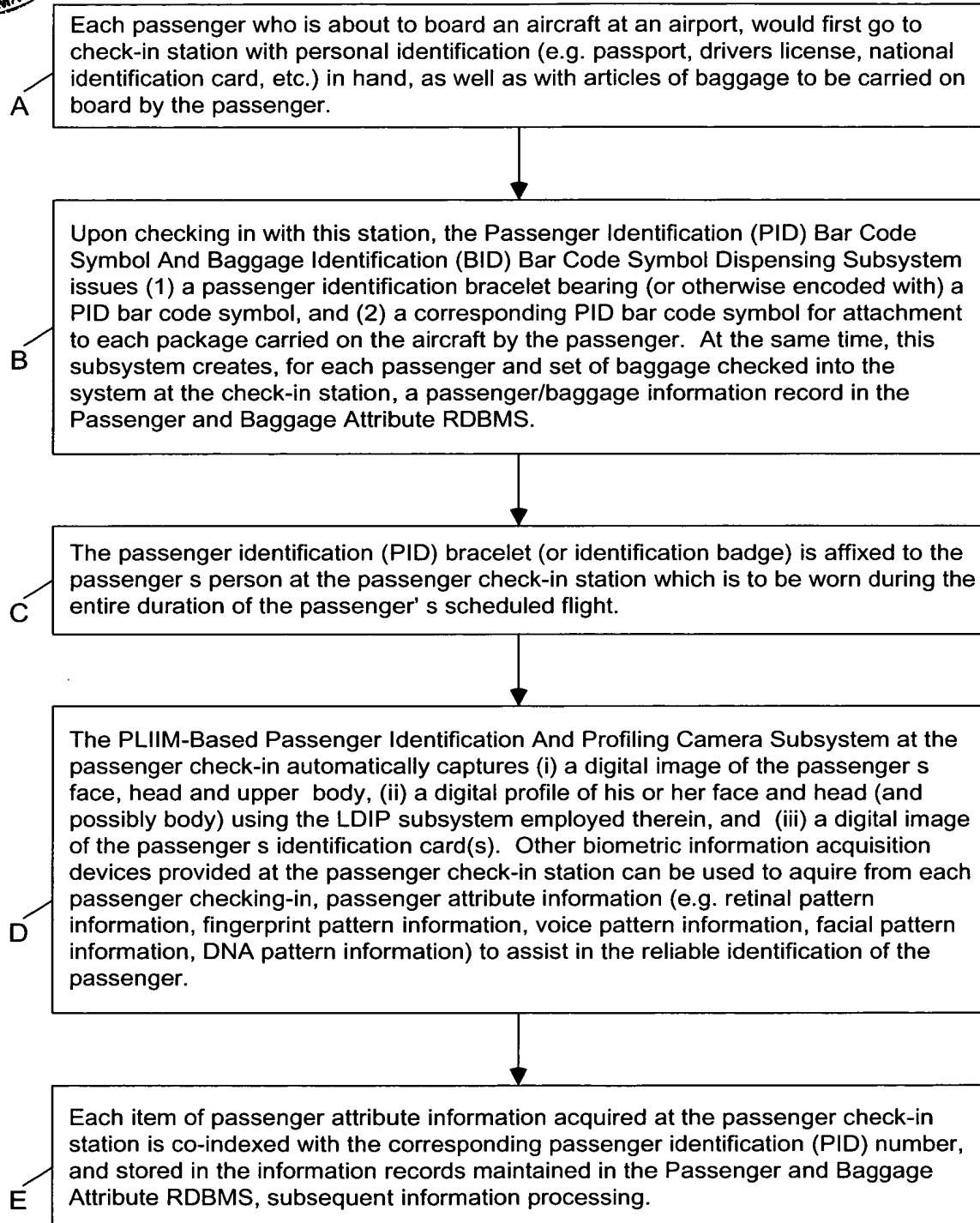


FIG. 68D1

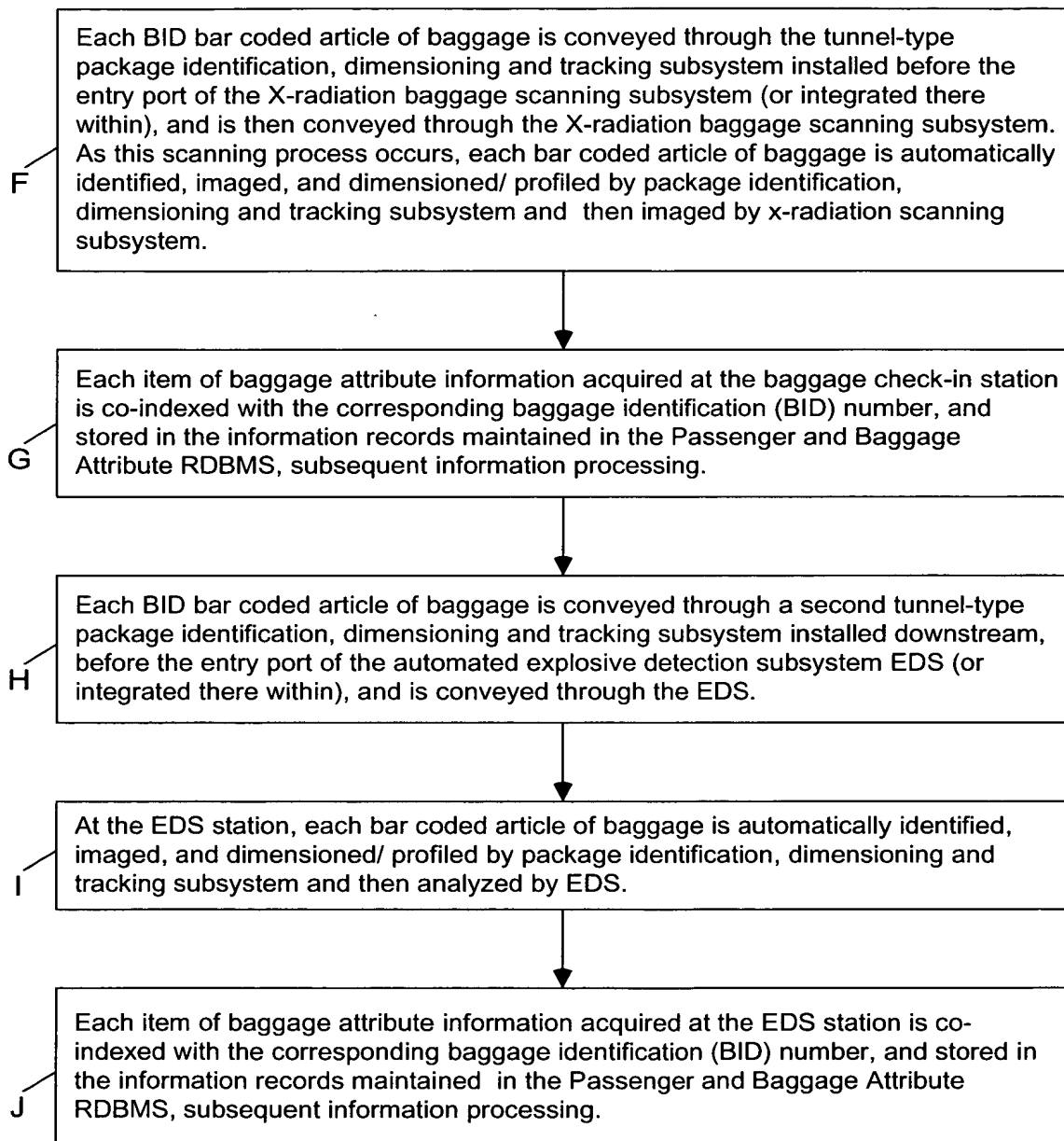


FIG. 68D2

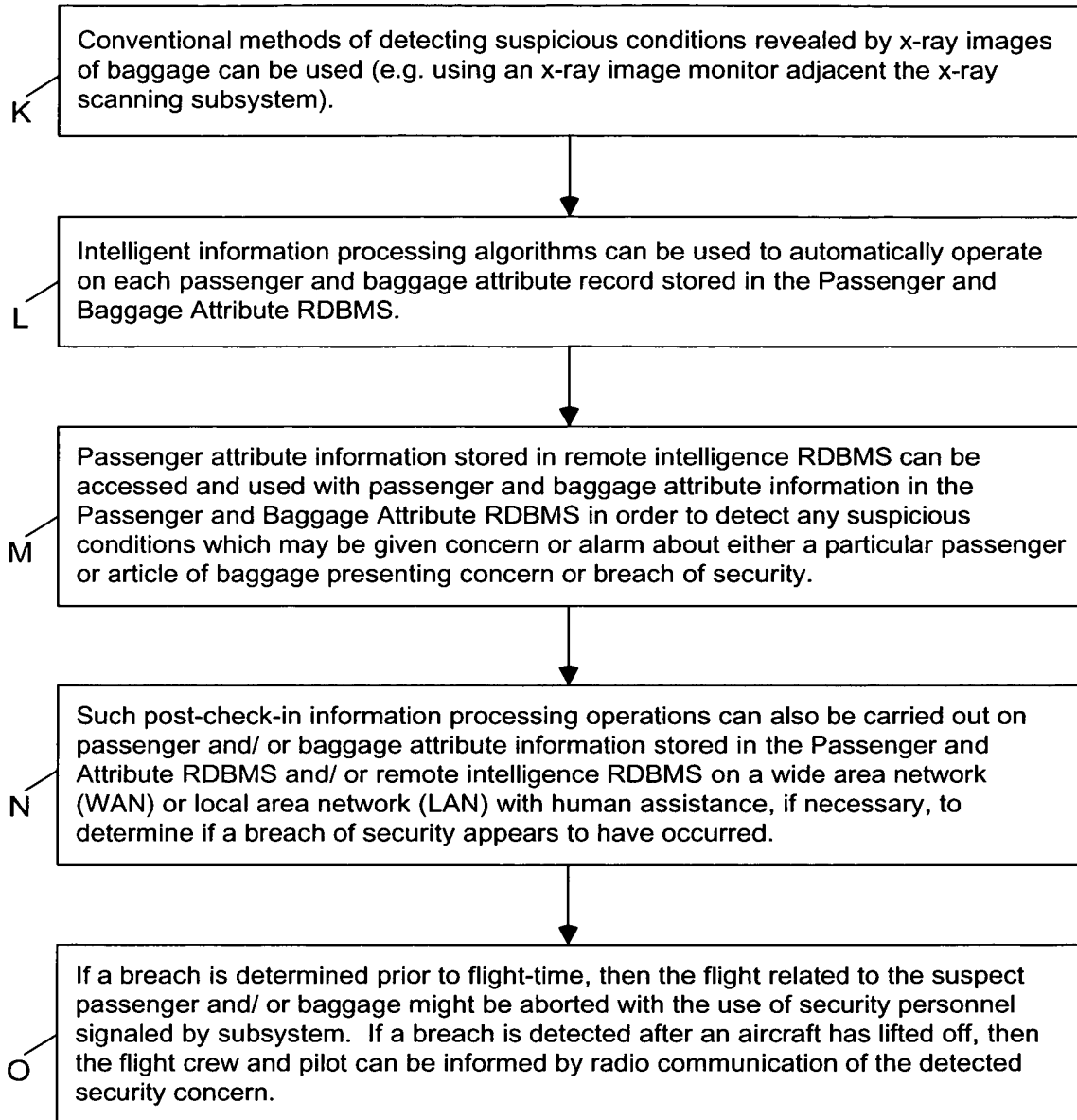


FIG. 68D3

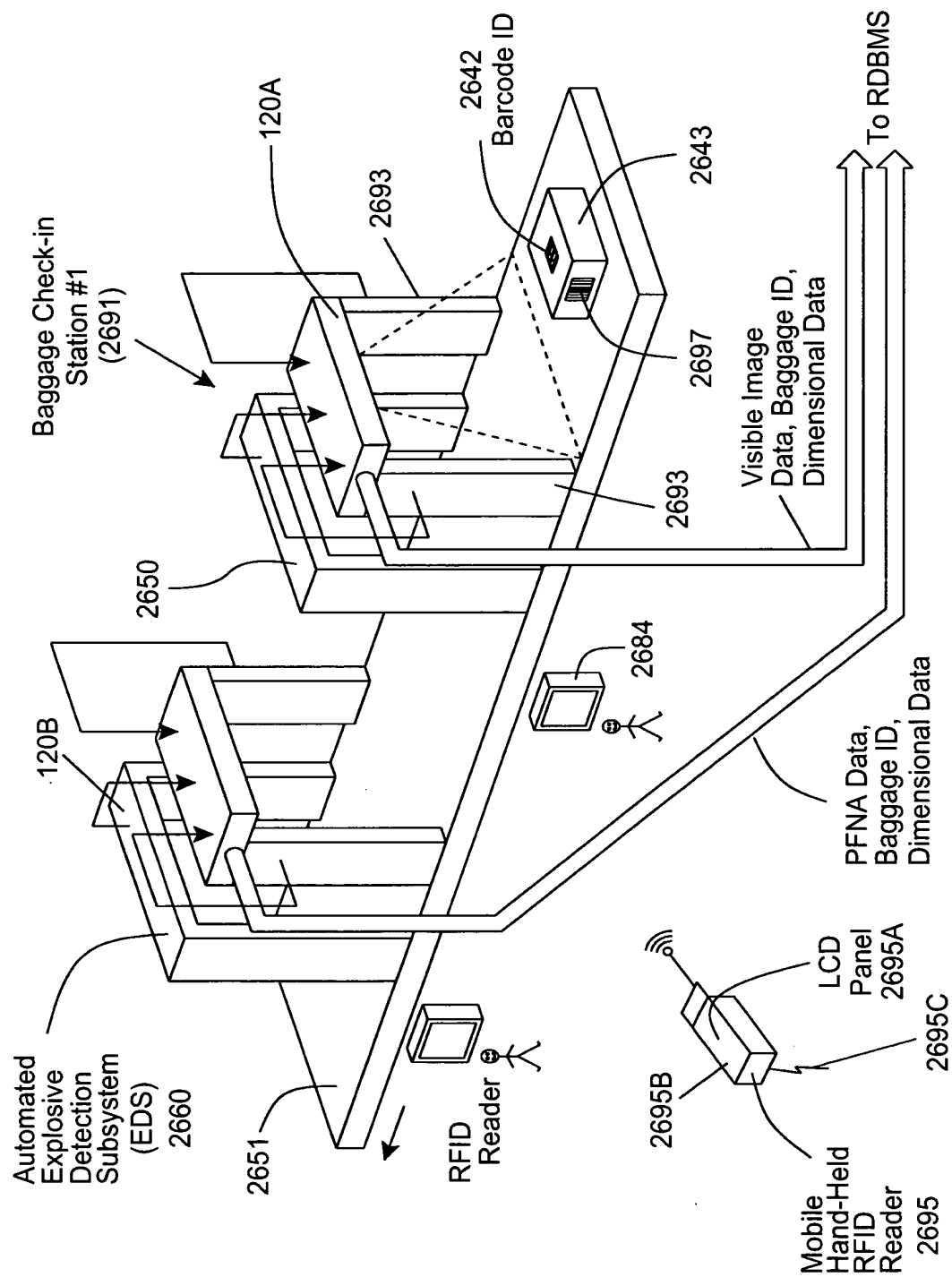


FIG. 69-1

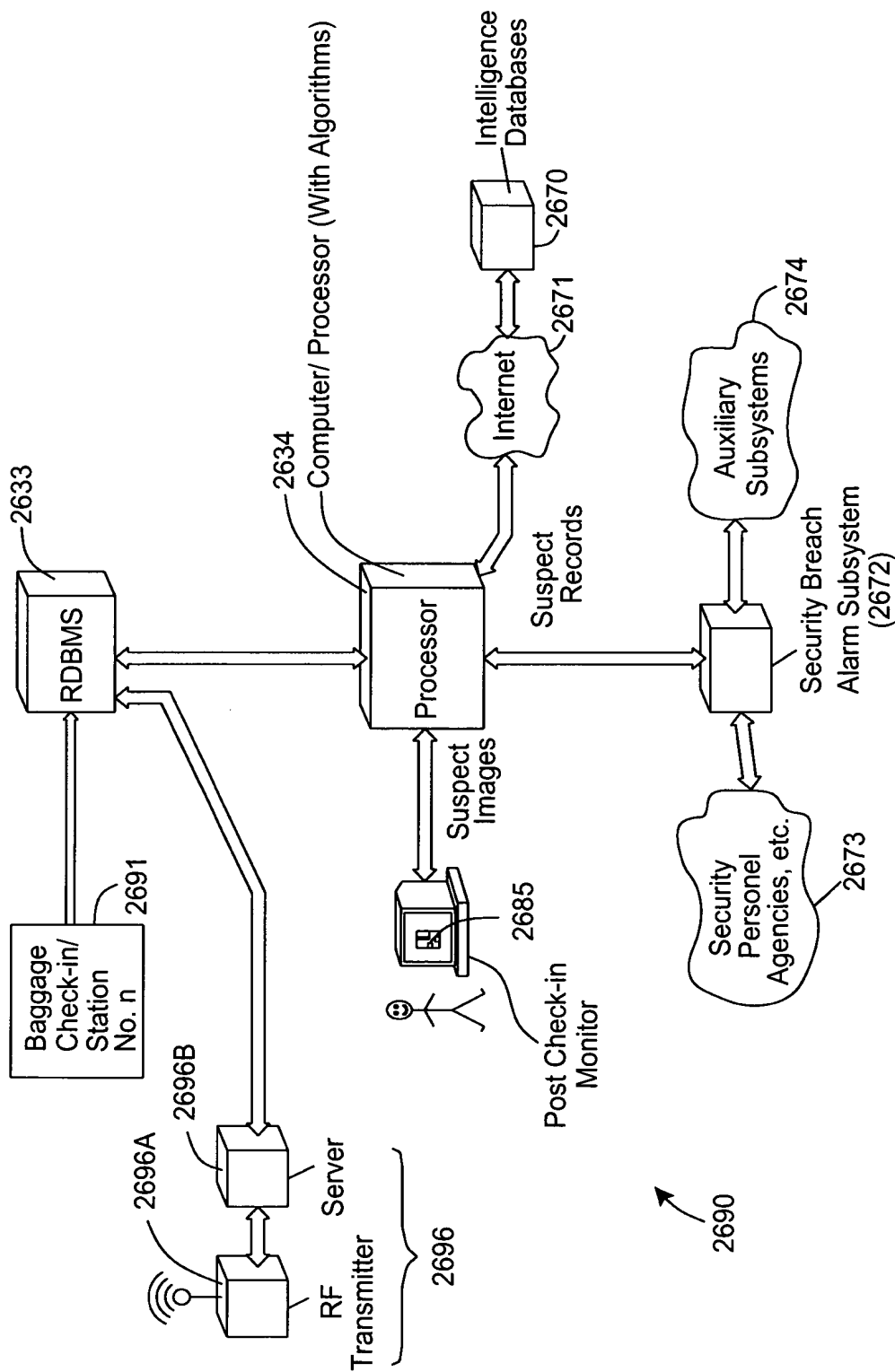


FIG. 69-2

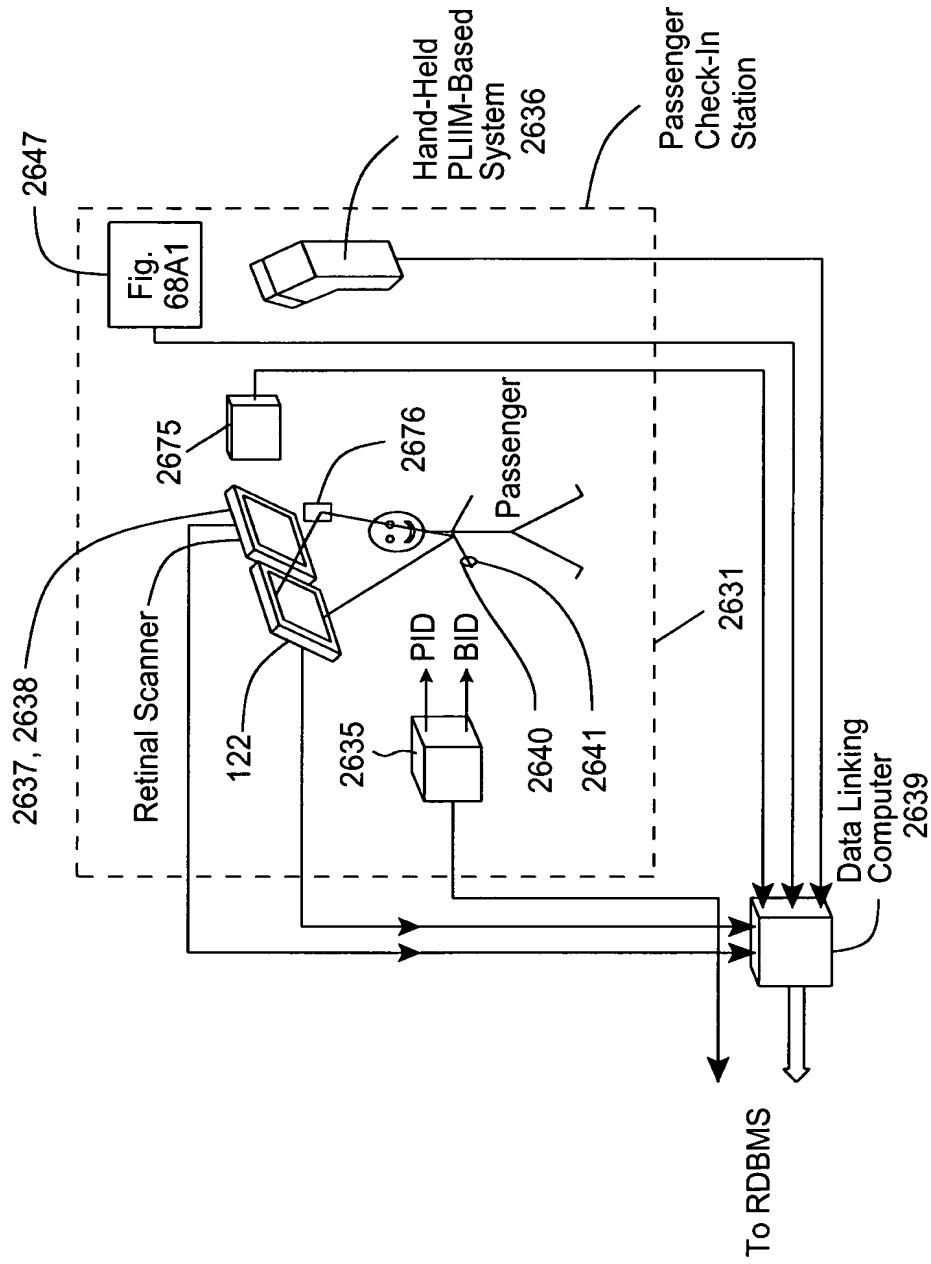


FIG. 69-3

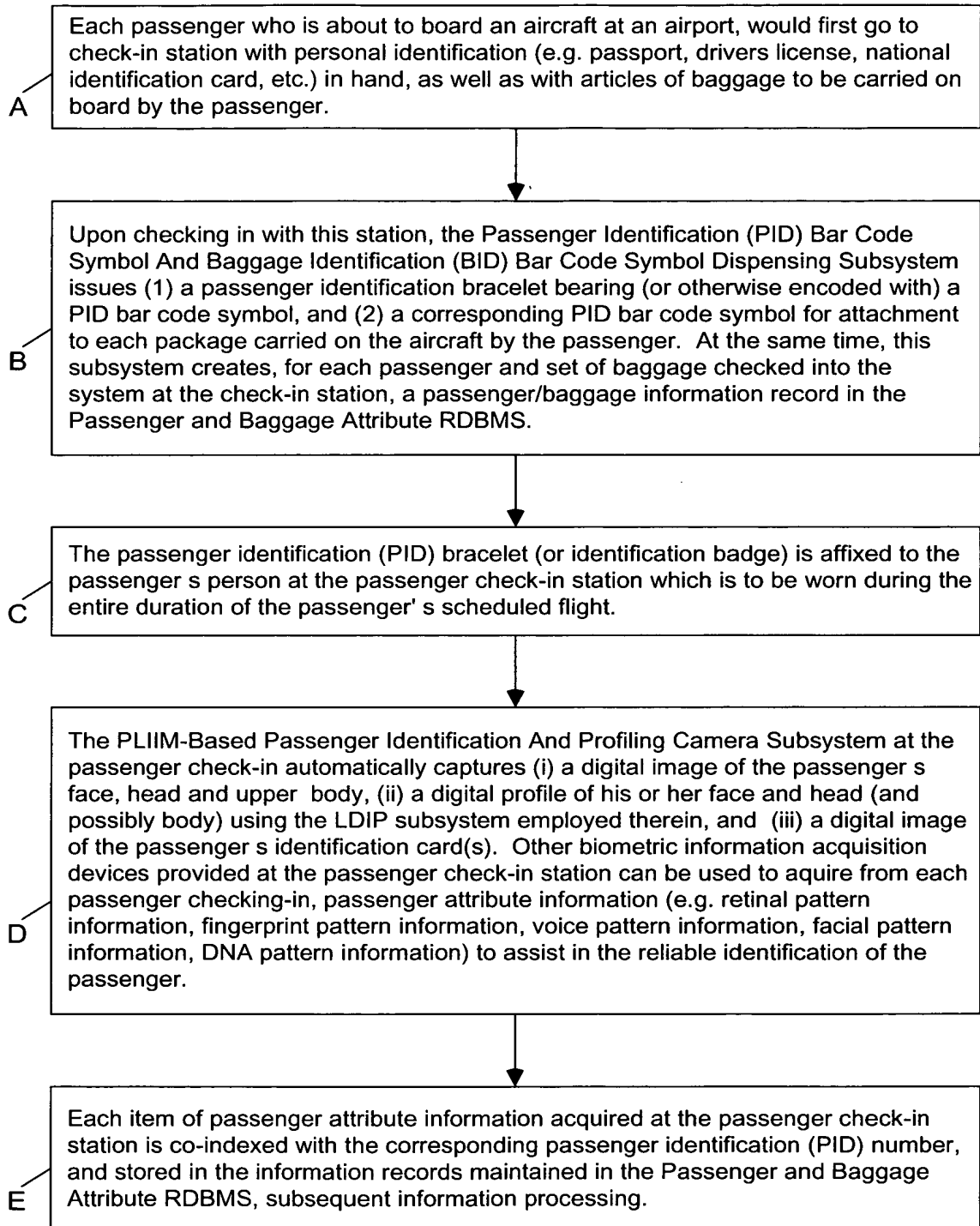


FIG. 69B1

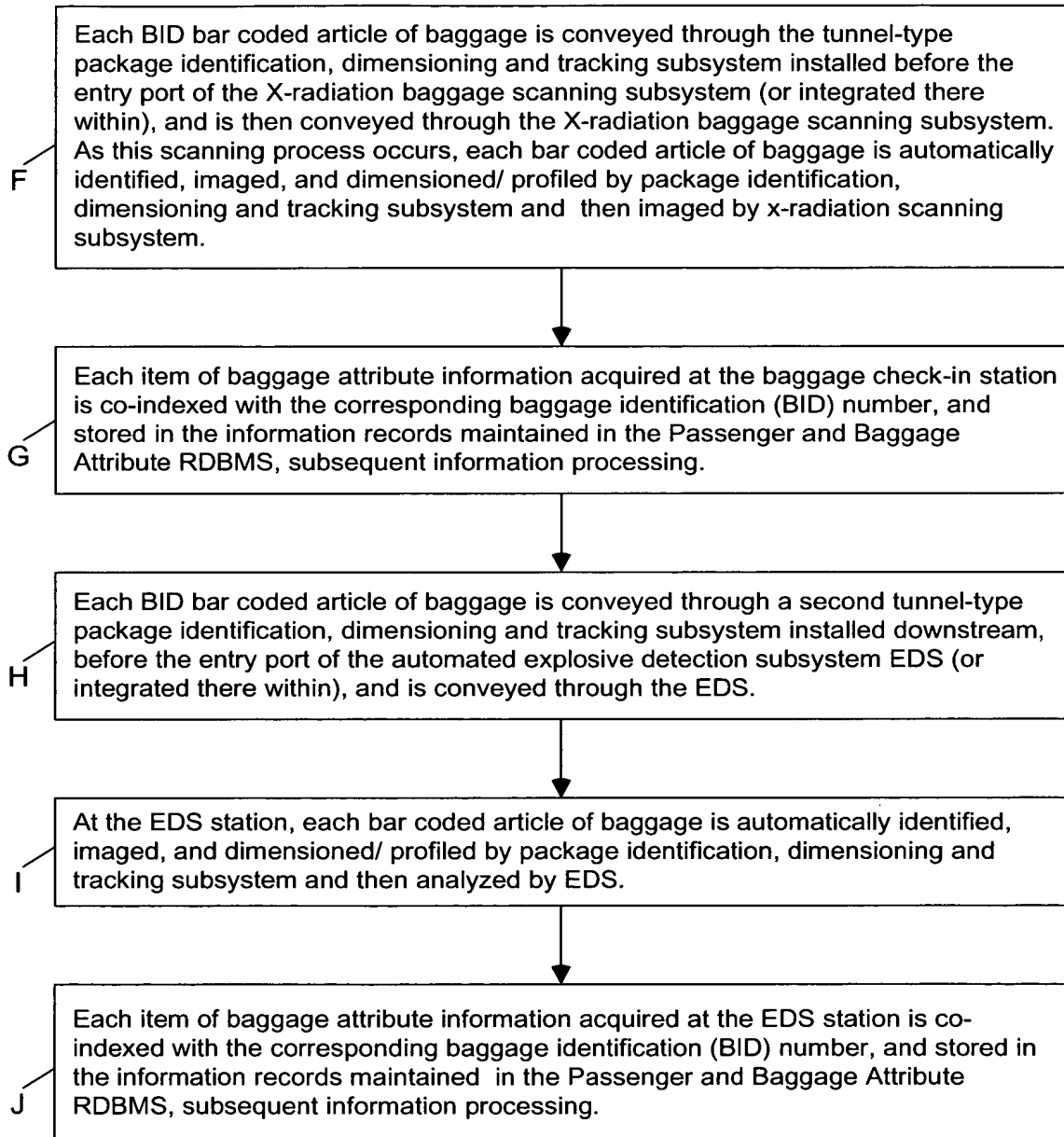


FIG. 69B2

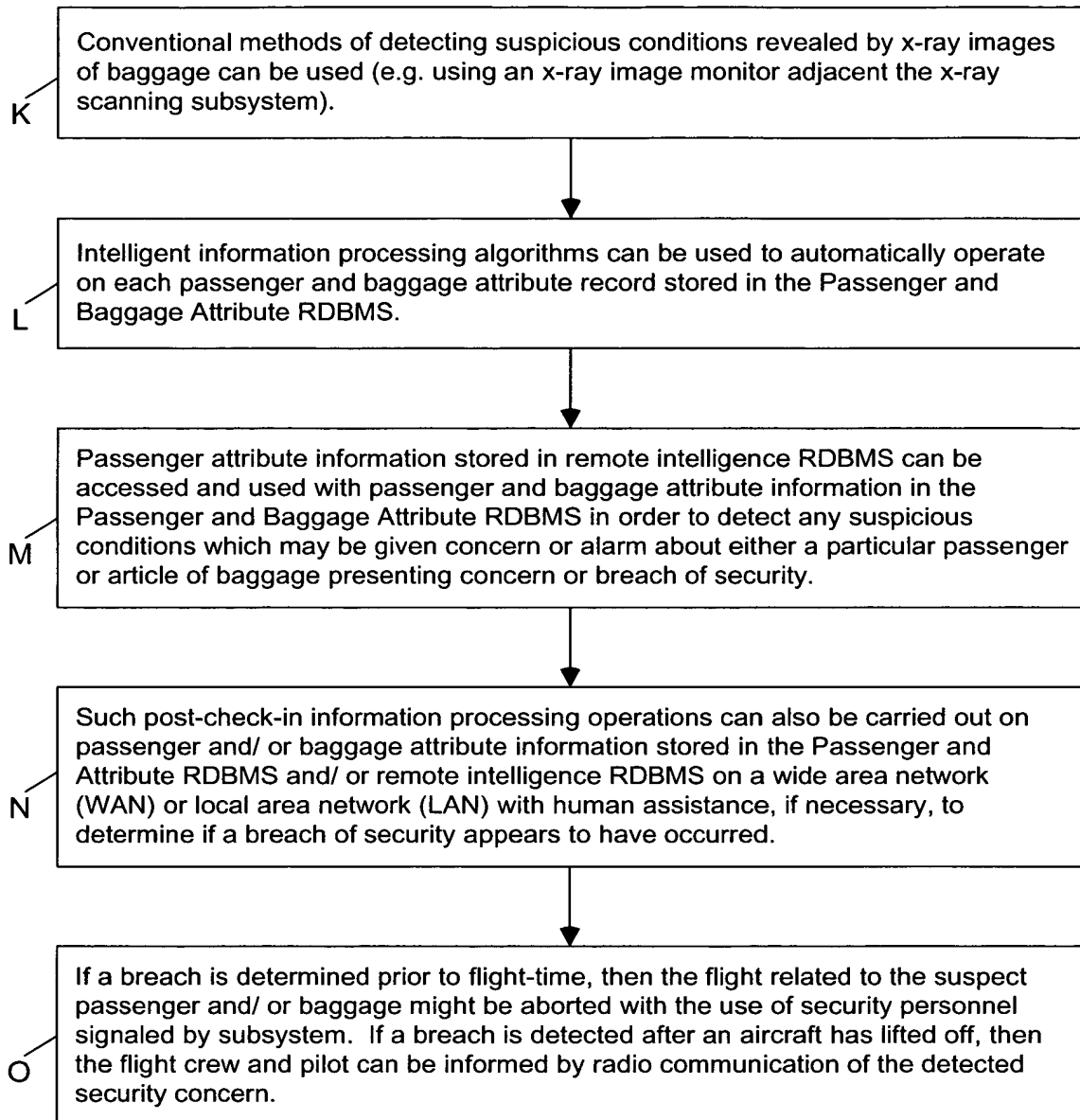


FIG. 69B3

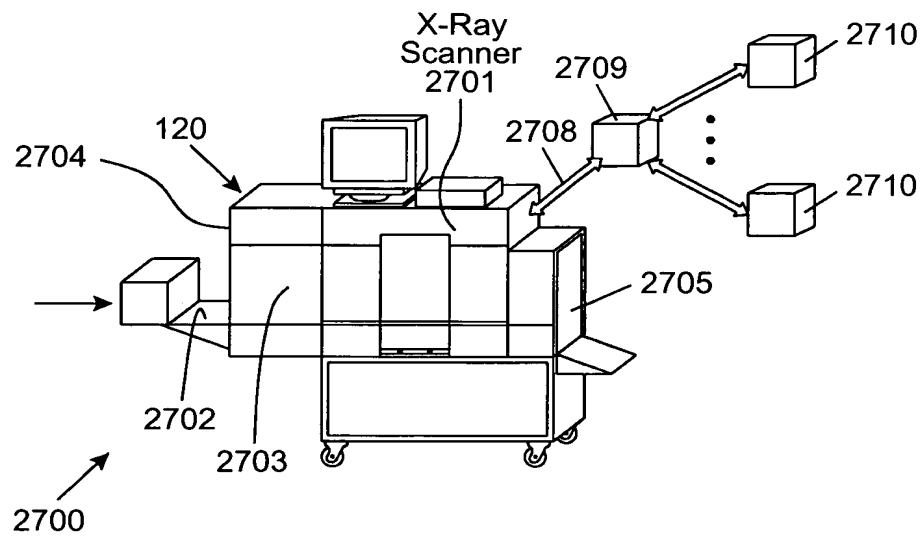


FIG. 70A

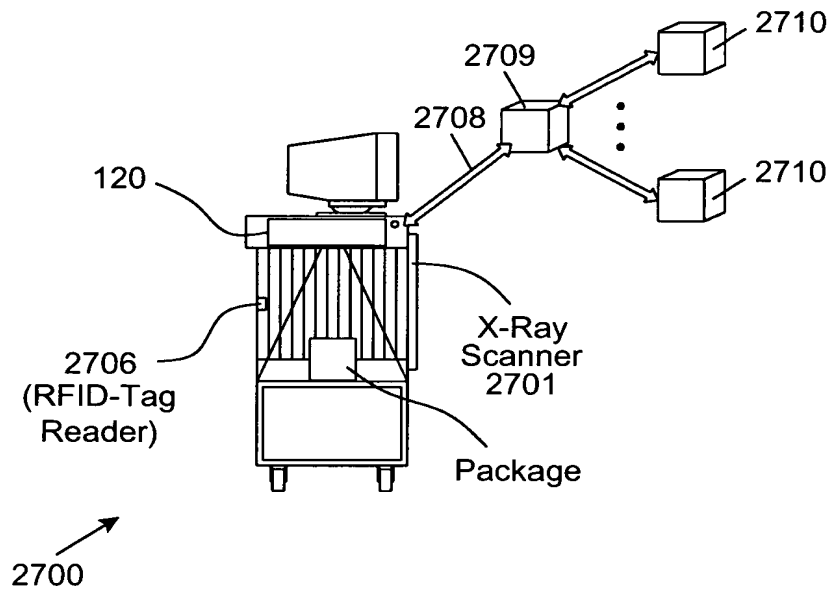


FIG. 70B

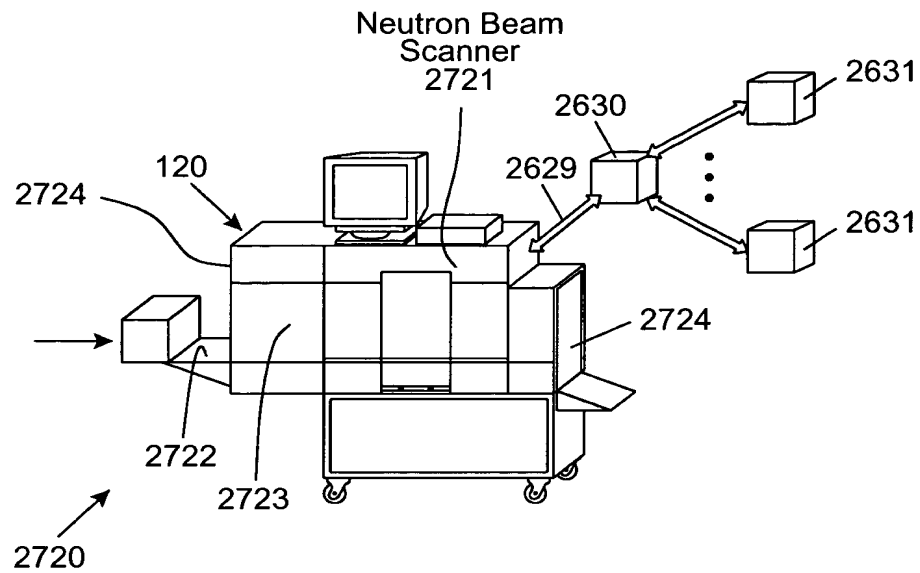


FIG. 71A

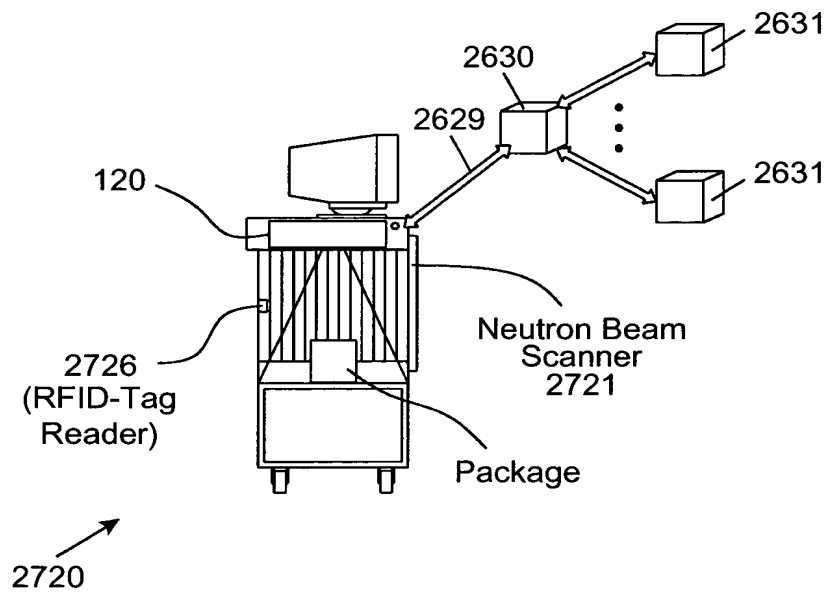


FIG. 71B

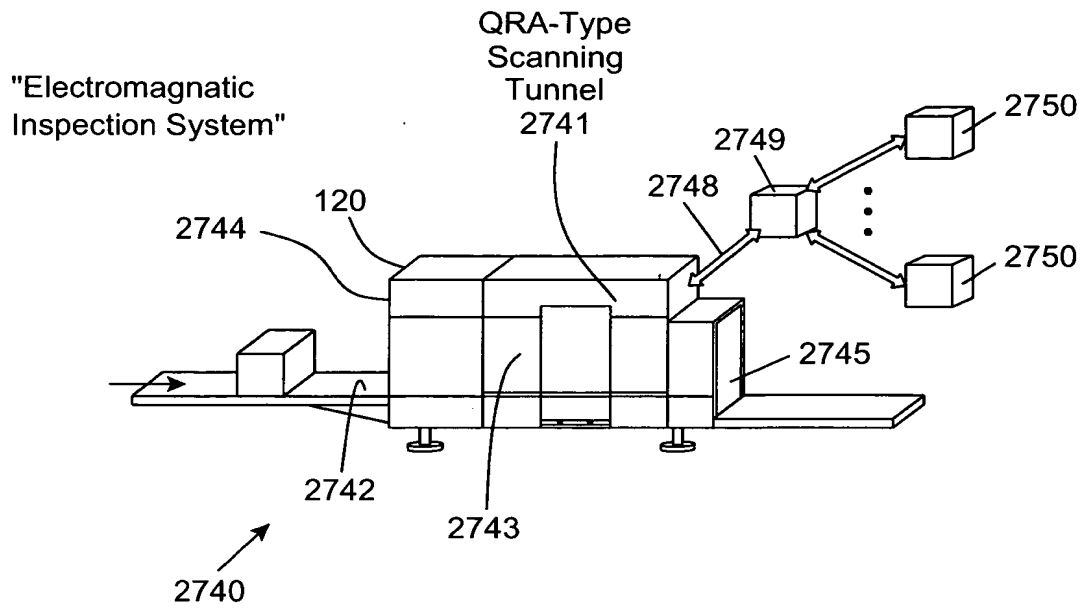


FIG. 72A

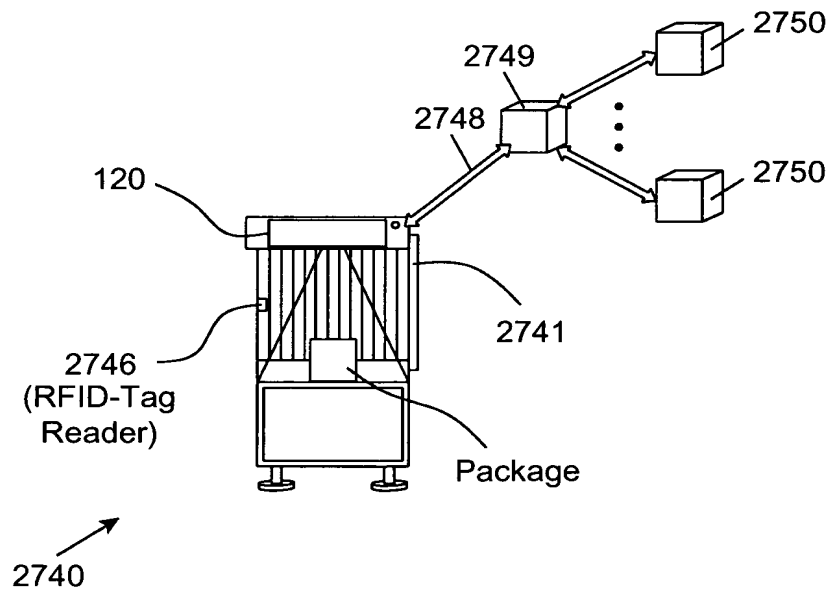


FIG. 72B

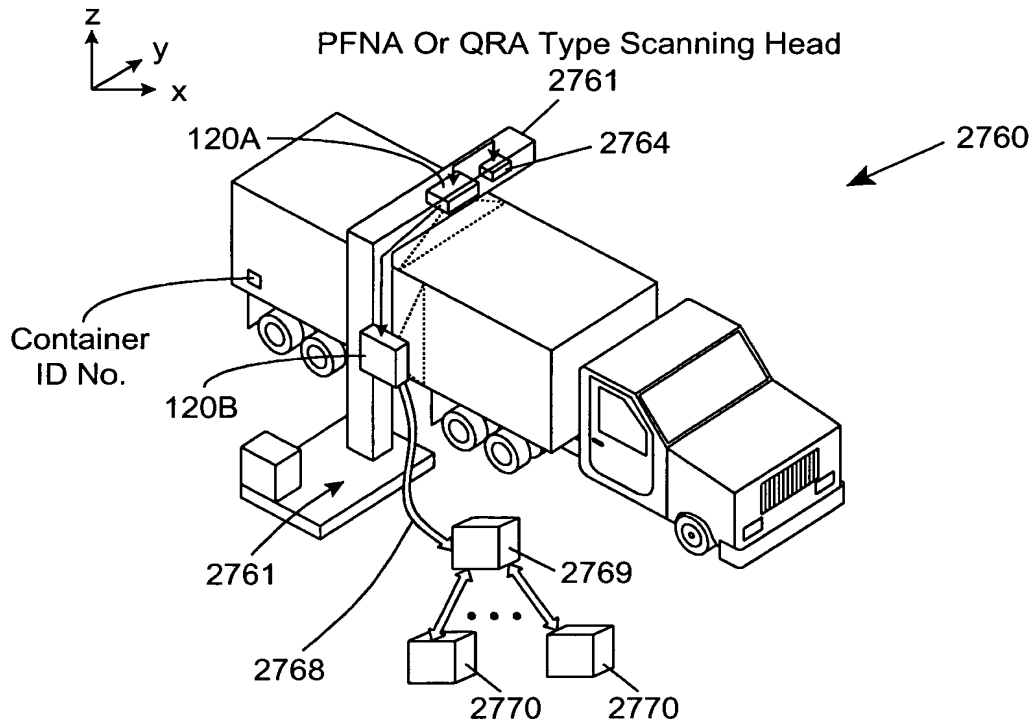


FIG. 73

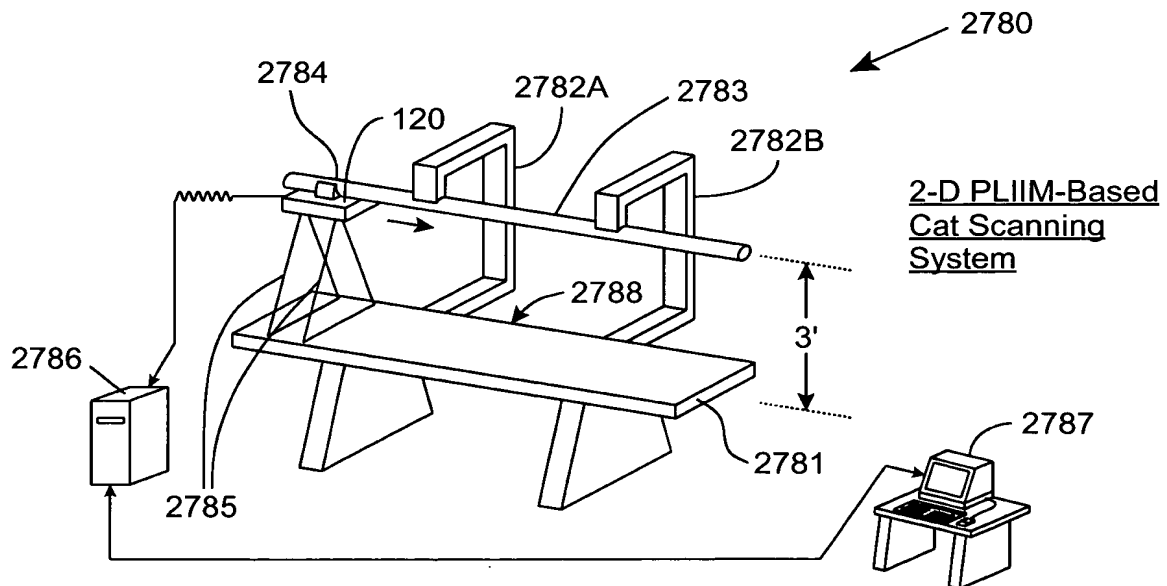
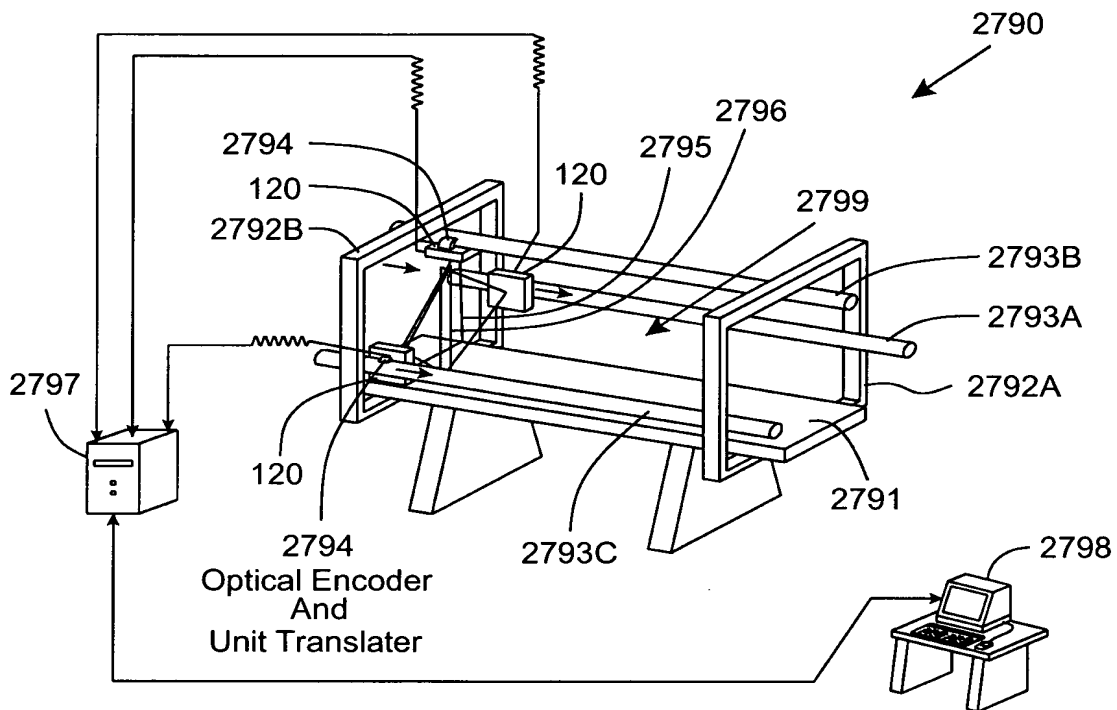


FIG. 74



3-D PLIIM-Based
Cat Medical
Scanning System

FIG. 75

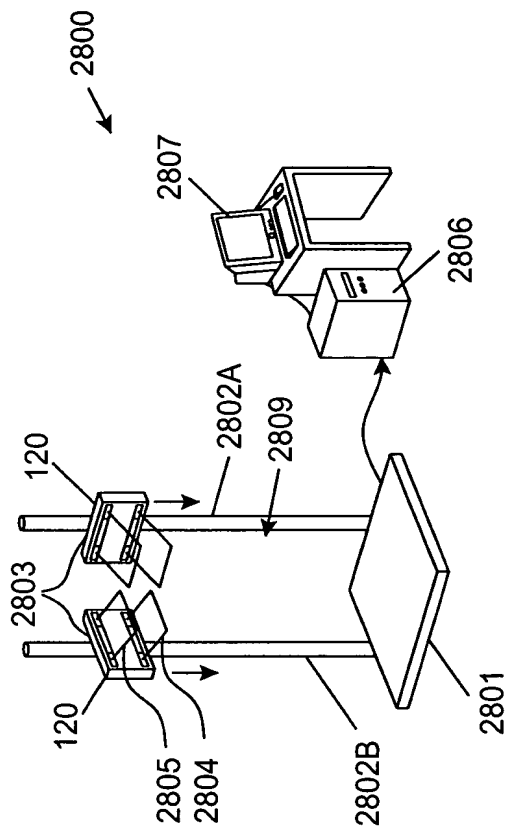


FIG. 76

"3-D Hand-Supportable
 Mobile Digitizer"
 2810

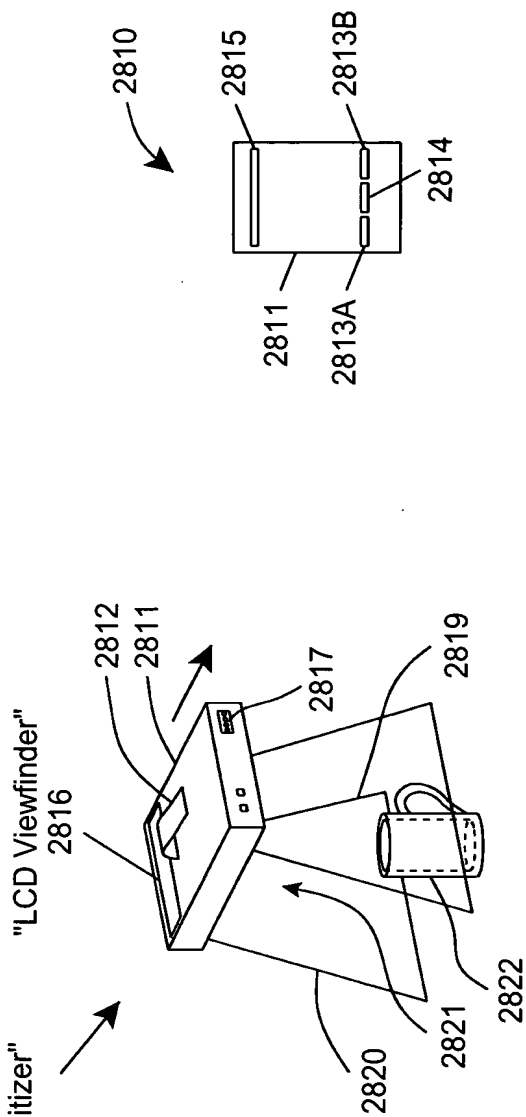


FIG. 77A

FIG. 77B

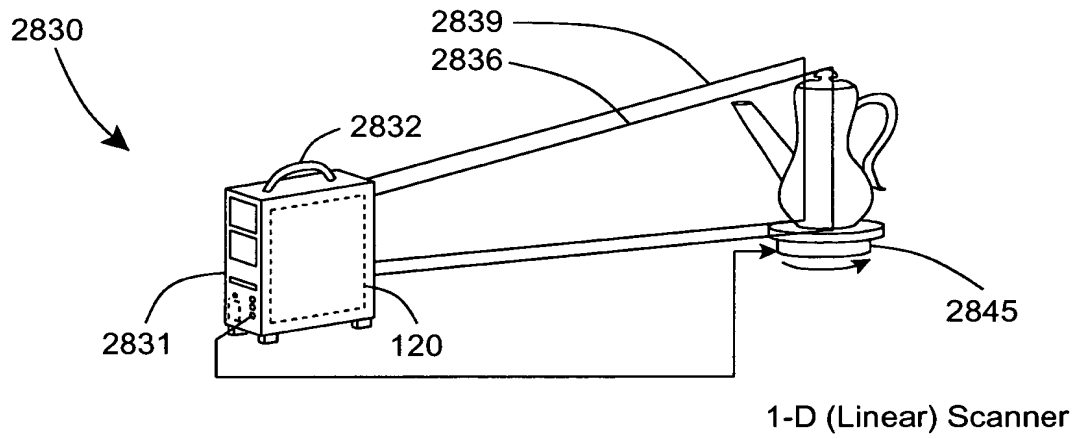


FIG. 78A

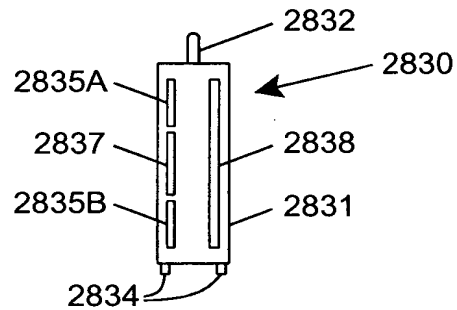


FIG. 78B

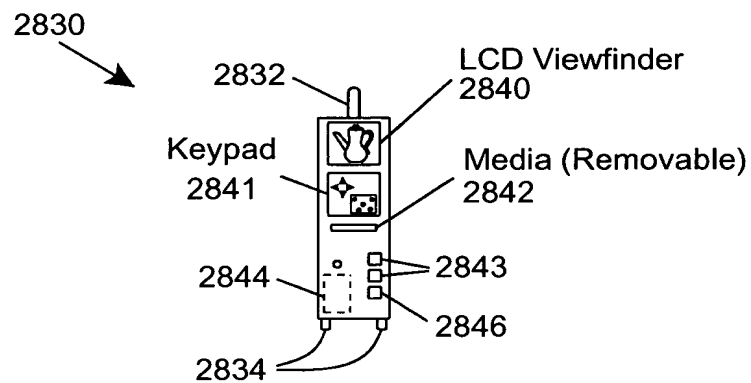


FIG. 78C

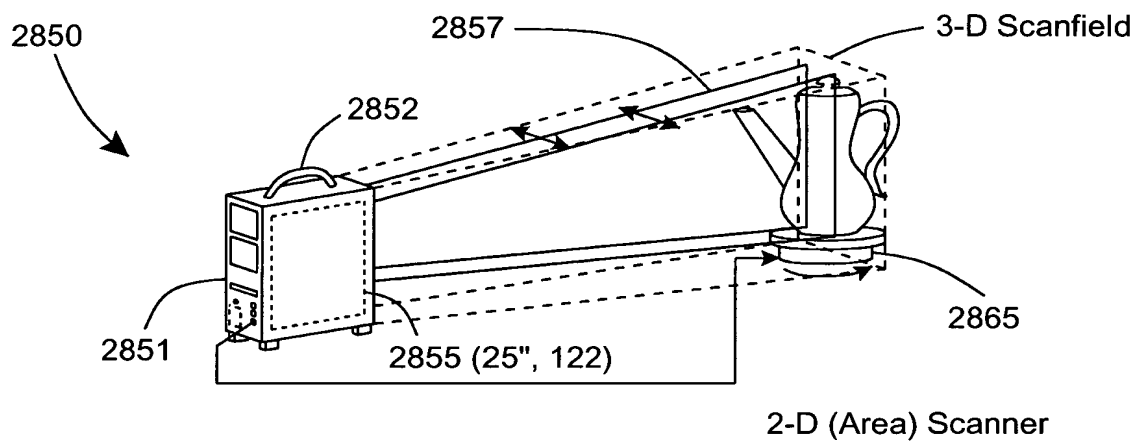


FIG. 79A

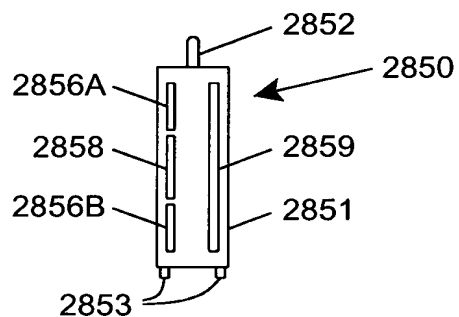


FIG. 79B

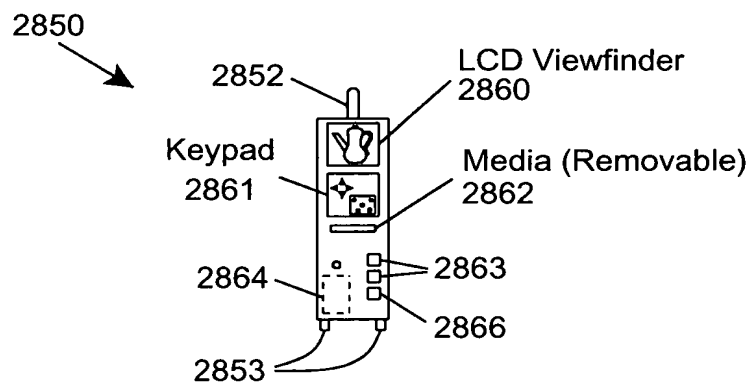


FIG. 79C

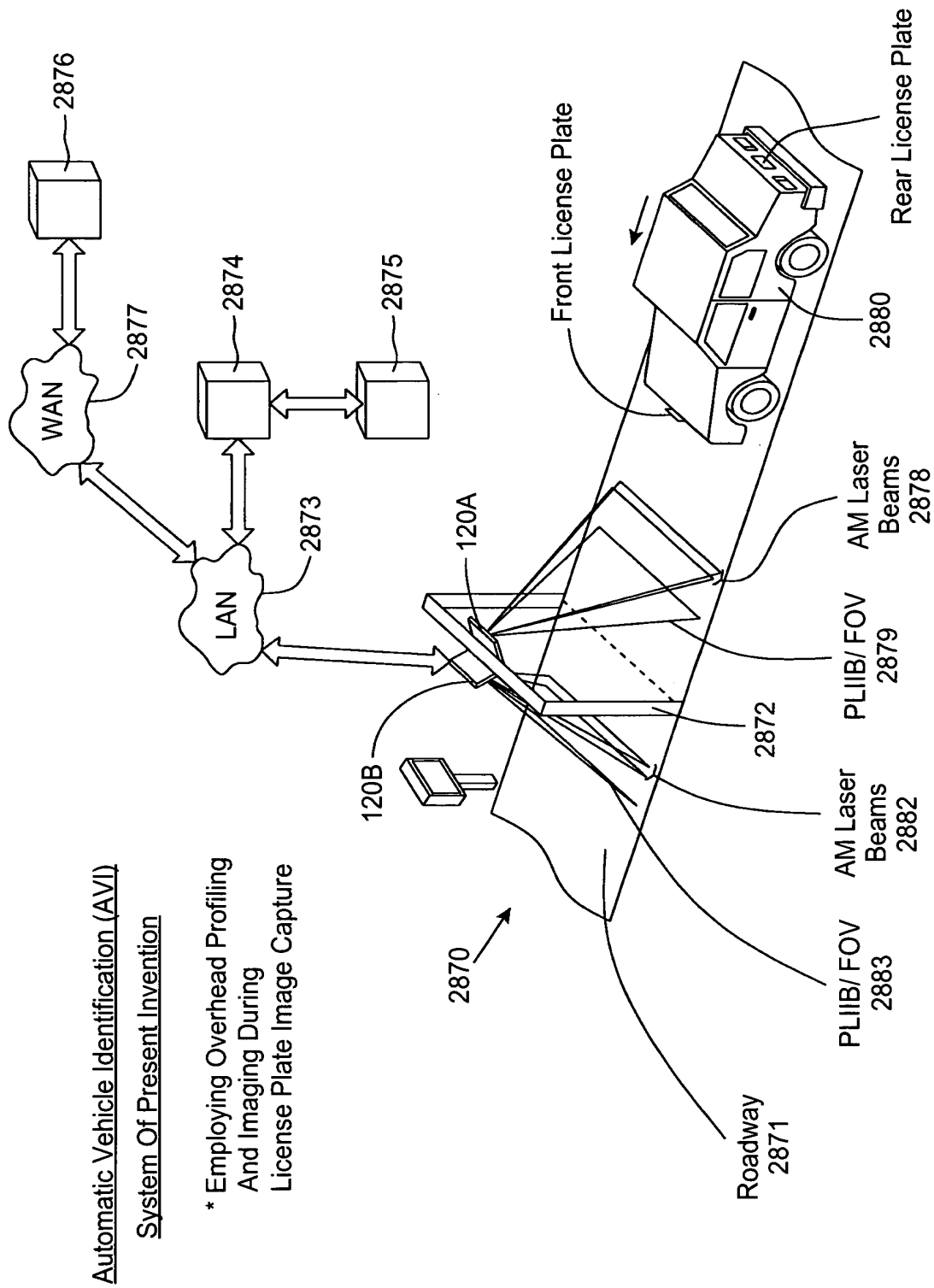
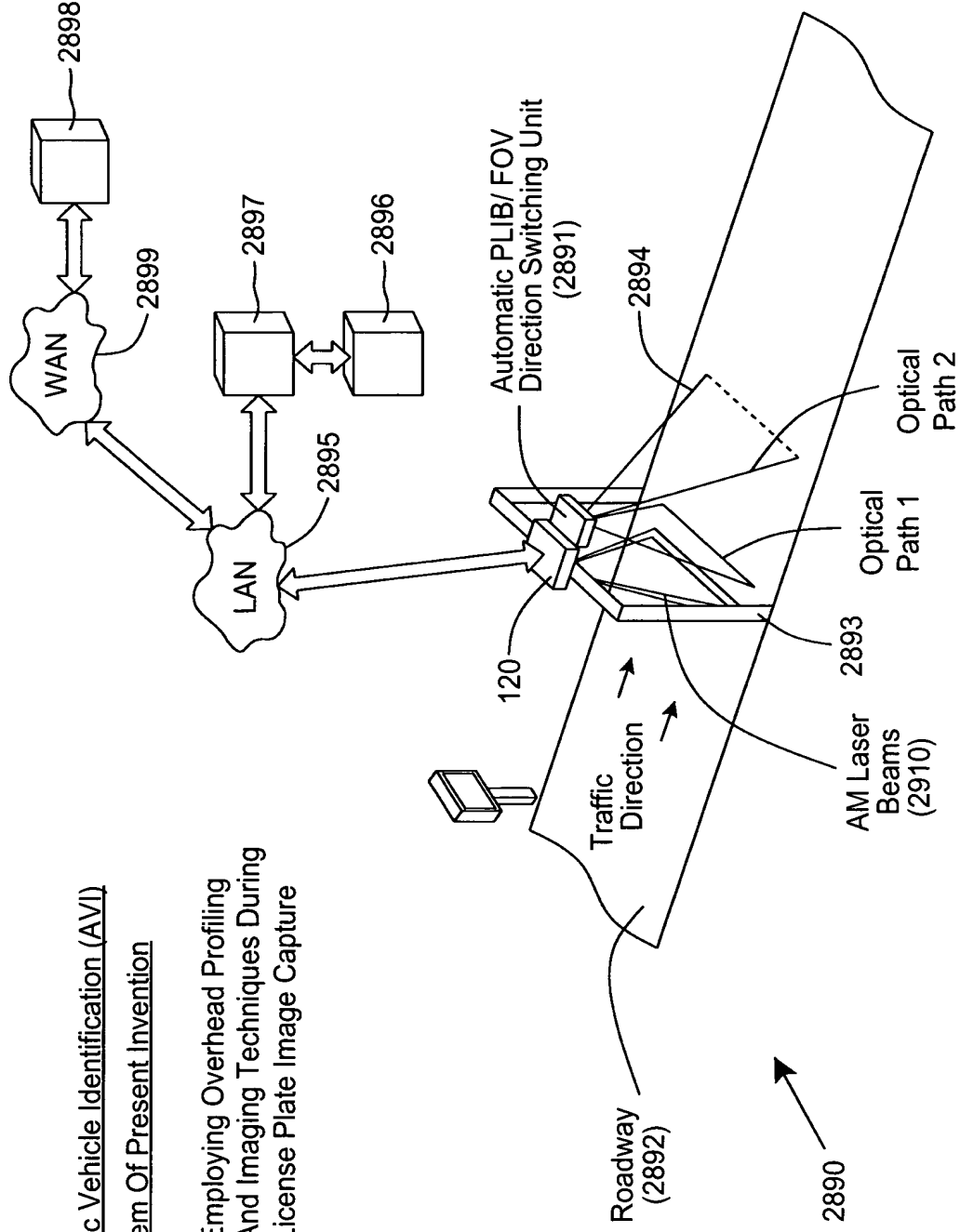


FIG. 80



Automatic Vehicle Identification (AVI)

System Of Present Invention

* Employing Overhead Profiling
And Imaging Techniques During
License Plate Image Capture

FIG. 81A

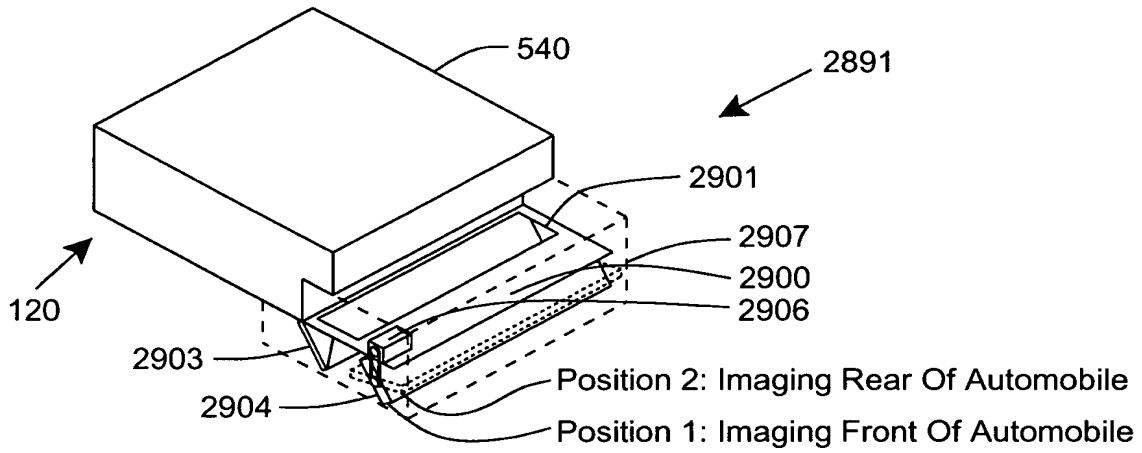


FIG. 81B

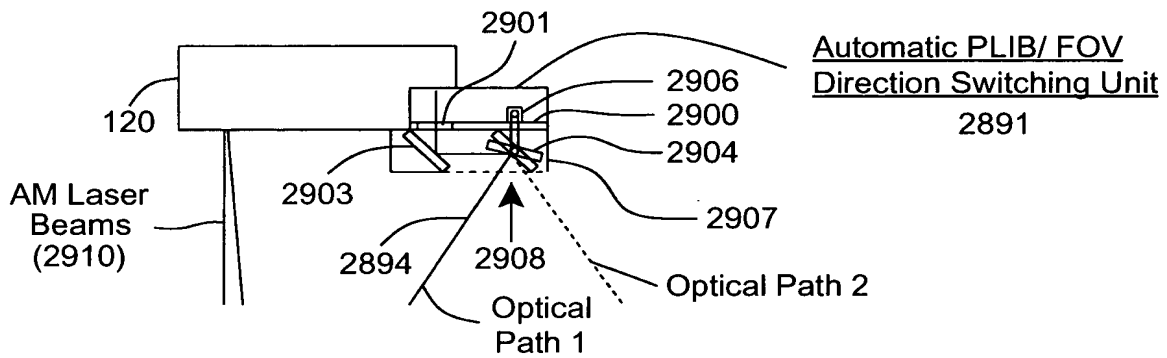


FIG. 81C

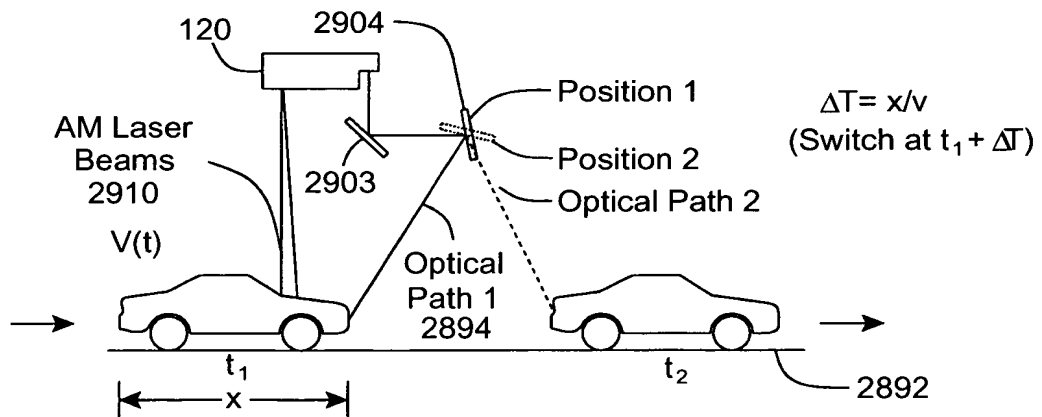


FIG. 81D

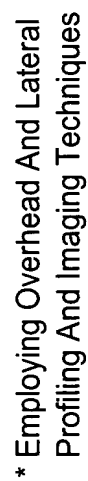
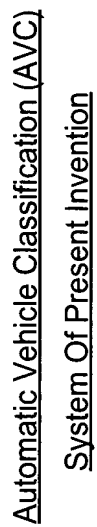


FIG. 82



Automatic Vehicle Identification
And Classification (AVIC) System
Of The Present Invention

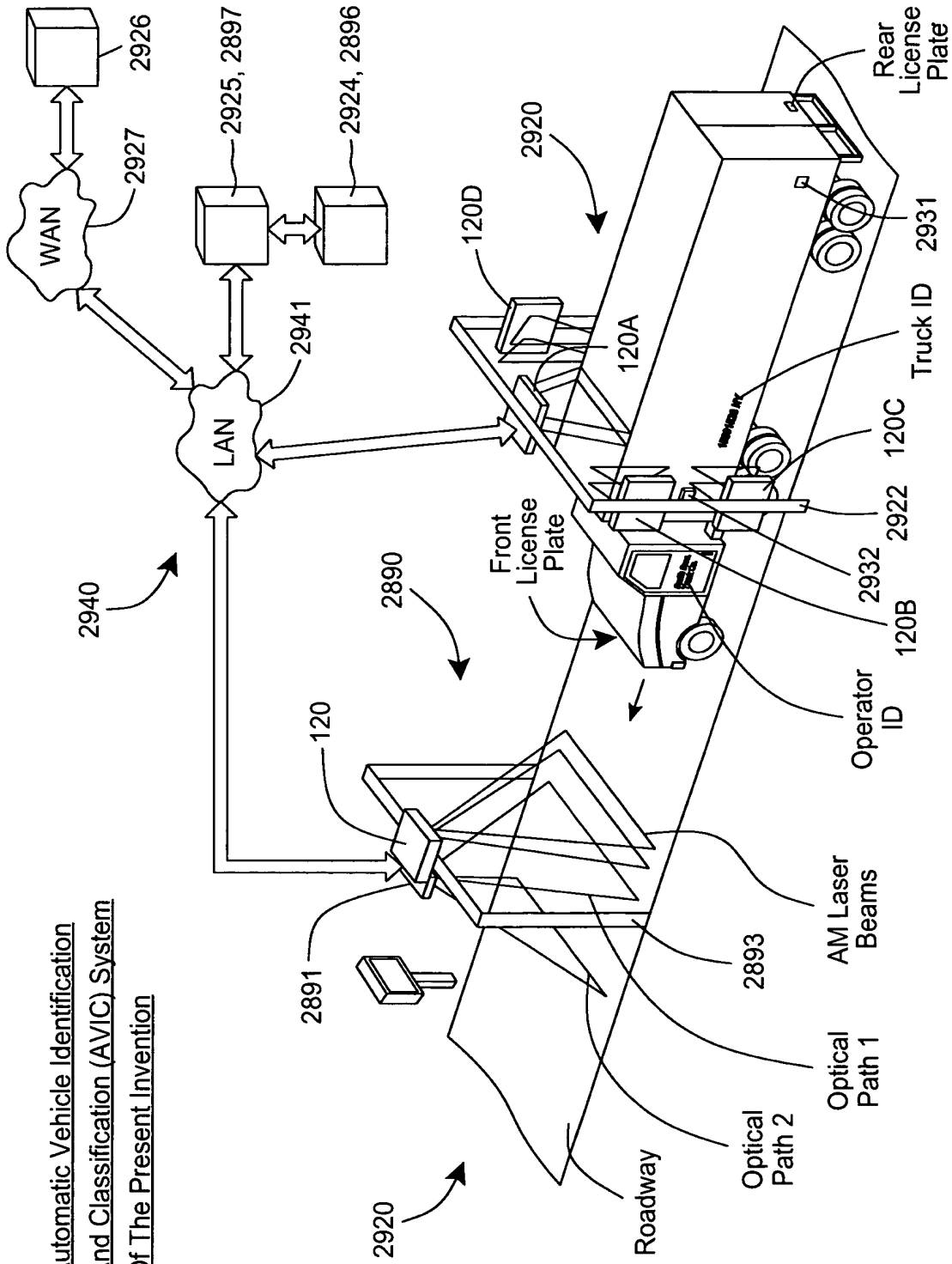


FIG. 83

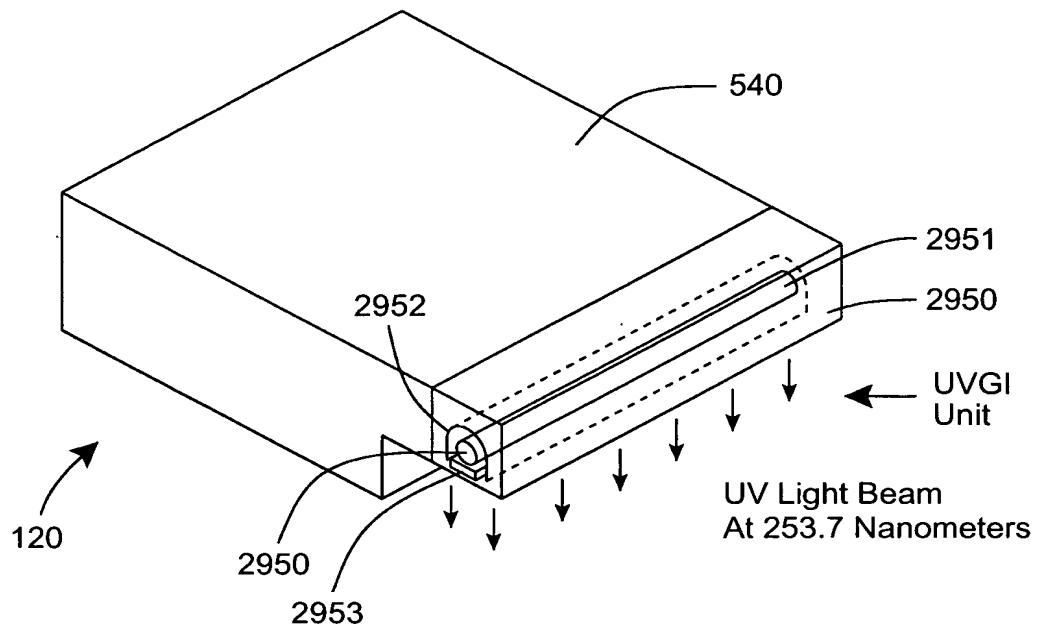


FIG. 84A

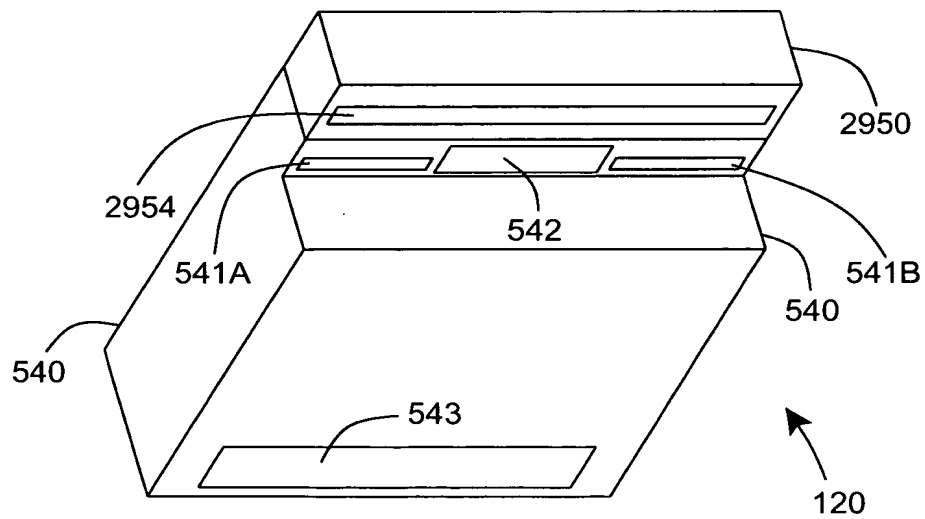


FIG. 84B